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T H E "G A R T E R" O P E R A T I O N

WITH REMARKS ON THE ETIOLOGY AND TREATMENT
OF VARIX AND VARICOSE ULCERS OF THE LOWER LIMBS.

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I N D E X .

	Page
Introduction	3
<u>Section I.</u> The Garter Operation	11
Its Principle	15
Its Technique	17
Objections	22
Cases	34
Summary	76
<u>Section II.</u> The treatment of Varix	80
Medicinal	93
Mechanical	100
Operative	105
The Treatment of Varicose Ulcers	128
Operative	130
Mechanical	133
Medicinal	136
<u>Section III.</u> The Etiology of Varix	144
Heredity	147
Vascular Affinities	148
Developmental Origin	149
Race	150
Sex	159
Age	163
Superficial & Deep Varices	167
Anatomical, Physiological & Pathological Causes	176
Traumatism	180
Gravity	183
The Etiology of Varicose Ulcers	184
Index of Authorities	188.

INTRODUCTION.

Since graduating as M.B., C.M. in 1885 I had the privilege of studying Varix under Dr. Heron Watson and Dr. P. H. Maclaren at the Chalmers Hospital and Royal Infirmary respectively, in both of which institutions I was a house surgeon. In India I have obtained considerable operative experience of Varix amongst Europeans, as I was for five years on the staff of the Presidency General Hospital, Calcutta, which receives most of the sick seamen of that Port, and is the principal hospital for Europeans in Assam, Bengal, the North West Provinces and Punjab. As civil surgeon of Chittagong, its port and district, and as one of the surgical staff of the Medical College and Ezra Hospitals, Calcutta, I enjoyed other opportunities for the clinical study of varix amongst a mixed population of Europeans, Jews, Eurasians, Natives of India and Chinamen.

Influenced in the beginning by the teachings and practice of Mr. John Duncan (under whom I had been a student, dresser, clinical clerk and temporarily acting house surgeon) I operated for some time by his plan of multiple subcutaneous ligatures. But I abandoned this in preference for the "open" method of

short incisions, double ligatures, and division of the veins. Next, I combined this procedure with excision of small portions of the affected vessels. This led me on to excision of varicose masses by dissection in appropriate cases, and occasionally to the removal of several inches of some specially dilated and thickened vein. These processes I sometimes varied by, or associated with, excision of an inch or two of the long saphena vein near its termination in the cribriform fascia.

All these courses are well known, and have been ably advocated by various surgeons. Still, all these methods, besides many others detailed later, leave something to be desired: none of them can be said invariably to effect a "radical cure." Particularly is this so in aggravated cases with chronic ulceration in the lower third of the leg. As an attempt to meet this want I devised the circular operation, which is described in this thesis. But my experience has been curiously unequal, because, though I have performed several hundreds of operations on the natives of India, yet I cannot recall one for varix of the lower extremities or its complications. In fact, I have seen comparatively little - I may say exceedingly little -

of this form of varix while I was holding appointments in which my work lay chiefly amongst the natives of India. I do not remember treating in hospital any case of varix of the leg during the time I was Medical Officer of the 2nd Gurkhas, 26th, 27th & 28th Punjab Infantry, 4th & 16th Bengal Cavalry, or 9th & 13th Bengal Lancers. Very few indeed were the instances in which I had occasion to reject a native recruit for these or other regiments owing to this cause, and I was obliged to examine a large number of recruits for the Native Army at such centres as Delhi and Rawal Pindi. Nor do I recollect seeing this disease among the Lushai savages, many of whom came to me for medical or surgical relief during the fifteen months I spent on active service in that mountainous country which borders on Burma and Arrakan.

The same remarks apply to my service under the civil administration in India. I cannot bring to mind the case of any native candidate rejected by me on this account for subordinate civil or legal appointments, for the Forest, Police, Jail, Asylums or Vaccination departments. Although the number of Europeans examined by me for subordinate Government posts was insignificant, yet I had to refuse some owing to varix of

the leg and other associated disabilities. During the time I was a member of the surgical staff of the Calcutta Medical College Hospital I do not think I operated even once on a native for this trouble, or that I saw a single case of n  vus in a native; though I certainly operated on Europeans, (of whom there were comparatively few patients in this institution), for both these affections. This hospital bears to the natives of Bengal and Upper India much the same relation as does the Royal Infirmary, Edinburgh, to the people of Scotland, except that the former draws its patients from a much wider area and from a vastly greater population.

The majority of the inmates of the jails and asylums of India consist of the poverty-stricken and labouring classes, amongst whom varix should be common, to judge from the analogy of Great Britain; but a retrospect of my work as superintendent of Asylums at the Presidency, and as Medical Officer at the Presidency Jail (1200 - 1300 prisoners), reminds me of scarcely any cases of varix requiring treatment. While Deputy Sanitary Commissioner of the Metropolitan and Eastern Bengal Circle I had to tour much in the provinces, and to mix freely with all sorts and con-

ditions of native men, women and children in the course of vaccination and spleen inspections, and during sanitary inspections of municipalities, factories, and tea estates, &c., yet I was almost as much impressed by the scarcity of vascular diseases of a surgical nature (venous, capillary and arterial), as I was by the prevalence of fevers, bowel complaints, intestinal parasites and skin diseases, &c. Fearing that my memory might have played me false regarding the scarcity of operable varix of the lower limbs in the natives of India, I have consulted the official medical returns for Lower Bengal, [§] and find that they fully bear out my impression. This province has been selected because the statistics are on such a large scale, and since most of my surgical experience was obtained in it. The three years from 1895 to 1897 are chosen as they are the most recent for which reports are available, and on account of the period corresponding with that in which the operations described later were performed. Separate annual and triennial reports are compiled for the medical institutions in Calcutta, and for those in the rest of the Province. It is only with the latter that I deal, because the statistics

§ Triennial Report on the working of the Charitable Dispensaries under the Government of Bengal for the years 1893 - 95.

Annotated Returns of the Charitable Dispensaries in Bengal for the years 1896 & 1897.

of the Calcutta hospitals would prove misleading. In this city there are hospitals exclusively for Europeans, for Jews, and for natives of India, while in others all races are treated indiscriminately, and there are yet others for special diseases.

On the other hand, in the "Mofussil" or Provincial hospitals and dispensaries the patients are nearly all natives of India, and thus the figures given form an index of the incidence of varix amongst the native population. It is true that accommodation for Europeans is provided in the hospital at Chittagong, and perhaps in a few other hospitals, also that poor Europeans seek medical relief at dispensaries; but the number is comparatively so small as not to vitiate the general results. The number of Europeans treated in the three years 1895 - 97 were 2,732; 2,845; 3,520, figures which are insignificant amongst over two and a half millions of Oriental patients. Still it is just possible that the very few cases of varix treated may have been Europeans, in which case the validity and cogency of my argument would be strengthened.

The population of Lower Bengal (exclusive of Calcutta) is over seventy millions (70,665,427),

for the needs of which there were 427 State-super-vised Medical Institutions in 1895 and 50 additional in 1897. The total number of patients treated (always excluding Calcutta) was 2,479,779 in 1895, 2,684,610 in 1896, and 2,834,112 in 1897: the total number of surgical operations performed during these three years was respectively, 119,776; 124,067; and 135,505. In 1895 the only operation on veins was one for the excision of varices! In 1896 phlebotomy was twice done, and there were four operations for varices - two by "obliteration" and two by excision. In addition two cases are noted in which there was "injection of other fluid than blood into veins;" but whether for transfusion or for other cause is not stated. In 1897 there was only one operation on veins, and that was for the "obliteration of varices." In these returns no mention is made of any operation for n evus, and the operations on arteries or for aneurism are conspicuously few. The reasons for this striking rarity, or less severity, of varix amongst Orientals are discussed under the section on Etiology.

In conclusion, I must apologise for the extremely personal nature of this introduction; but I thought it advisable to explain my limitations,

as well as my opportunities for studying the subject of this thesis, and at the same time to give some account of my stewardship to the authorities of my alma mater, who conferred on me the privilege of becoming one of her medical graduates.

I. The "Garter" Operation, or Circular Incision,
for Varix and Varicose Ulcers of the Leg.

The amount of literature on the subject, the number of medicinal and mechanical remedies, and the variety of operations devised for the cure of varices and varicose sequelæ in the lower limb, all combine to testify silently but significantly that the treatment of this affection still admits of improvement before a good and reliable, all-round satisfactory method can be hoped for. Especially is this true of bad cases with chronic ulcers, in which the diseased branches of the internal and external saphenæ meander as tortuous, dilated and thickened channels, forming knotty projections and prominent sinuosities in the sounder skin; and which disappear, or only show as depressed gutters lying immovably in the dry and scaly, firm and leathery, rigid or even oedematous skin. Or, again, those cases with callous, inflamed, or irritable ulcers, with hard, raised, punched-out edges surrounded by a discoloured area pigmented by extravasation, rendered sodden with serous exudation, indurated and adherent to fascia, muscle or periosteum by hyperplasia of connective tissue, constantly irritated by dirt and bacteria, and devitalized

by insufficient nutriment from the sluggish and impure current of venous blood.

The failure, or comparative futility of surgical or other measures for the cure of varix of the lower limb is not surprising when we see such cases and consider the numerous and varied factors which operate adversely. There may be an inherent congenital defect in the venous system, often hereditary; there may be feeble flow of the blood from weak heart's action or a tendency to coagulation from constitutional dyscrasia; there may be obstructive interference in the main venous channels by the pressure of pelvic or abdominal tumours, or by deformity resulting from malposition of badly united fractures, and through many other causes which act constantly or intermittently, including the force of gravity and the nature of the sufferer's occupation. The deeper veins of the limb may have been affected, and their valves rendered hopelessly inefficient, prior to the occurrence of the superficial varices. Then, also, there is the small amount of support, or the want of support, afforded to the superficial system of veins by the subcutaneous areolar tissue. In addition to all this, there is the anatomical fact of the numerous communications

existing between the deep and superficial systems of veins in the legs, so that temporarily or partially obliterated subcutaneous veins are consequently liable to have their channels reopened by the current of blood coursing into them. In the foot there are interdigital branches uniting the external and internal plantar with the superficial veins, and other branches join the plexuses on each side of the foot and ankle at the commencement of the external and internal saphenæ with off-sets from the deep veins. In the leg there are perforating branches which connect the internal saphena with the anterior and posterior tibial venæ comites, at the knee with the articular veins, and in the thigh with the femoral vein. Lastly, the long saphena is joined by the superficial circumflex iliac, superficial epigastric, and external pudic veins; not that they are of much consequence, but Mr. E. H. Fenwick⁽¹⁾ has shown there is an ingenious arrangement of valves and communicating branches with the abdominal veins which may discount any adverse effect from them. The external saphena, besides its communication in the foot and ankle with the deep veins, is also connected with the internal saphena, and receives a descending vein which courses down the back of the thigh.

(1)
B.M.J.,
1.X.81,
p. 561.

Two most important principles to aim at are to secure better support for the subcutaneous veins of the leg, and to improve the trophic condition of the skin and other tissues when there is ulceration.

As Professor Chiene⁽²⁾ remarks with reference to ulcers generally:- "Improve the vitality of the soil, and the putrefactive organisms will die out, not finding a suitable nidus for their further growth and development." Much can be effected by absolute rest and raising the feet above the level of the body, - in fact, this should be the basis of all modes of treatment, - and by the application of mild antiseptic, stimulant or astringent dressings and bandages; but the tendency to relapse remains when the patient resumes his former habits of life. Support of the superficial veins is in many cases efficiently rendered, and the state of nutrition of the tissues is improved up to a certain point, by the use of the rubber bandage invented by Dr. Martin of Boston. It has many and great advantages, because the patient is enabled to get exercise and do his daily work; but in the worse cases of varix and ulcer it fails to do more than act as a palliative of some value. Whereas, in tropical or sub-tropical climates at certain seasons, it may do harm by the cutaneous irritation caused from the retention of excessive

(2) Contributions to Practical Surgery: Ed. Med. J., June 1886, p. 1102.

sweat secretion.

The operation devised by Dr. P. H. Maclaren⁽³⁾ of the Royal Infirmary, Edinburgh, has the effect of bracing up the tissues of the leg, thus facilitating the return flow of blood up the veins. His object was to produce a natural elastic stocking by excising a long **elliptical** strip of skin from the back of the calf, and then bringing the edges of the vertical incisions into apposition with button sutures. In certain cases this procedure succeeds admirably, and while I was his house surgeon I saw very good results in some instances six months after operation. Still there are cases of varix with indolent ulcers that prove refractory to this method.

(3)
Ed. Med. J.,
Oct. 1889,
p. 363.

Early in 1895 I thought of a plan which may be called the "Garter" to distinguish it from Dr. Maclaren's "stocking" operation. Its aim is improved nutrition of the tissues and better support to the ascending column of venous blood; but these results are obtained on a principle differing essentially from Dr. Maclaren's tightening up of the skin of the calf. It consists in making a circular incision round the leg, through the skin and areolar tissue down to (but not through) the deep fascia, cutting across all subcutaneous vessels and nerves. Ligature,

above and below, of the cut ends of these veins effectually prevents the return flow of blood through the superficial channels, and thus shortens the column of blood contained in them. The result is that all the venous circulation below the level of the circular incision is driven into the deep veins beneath the deep fascia, in the intermuscular septa, and within the muscles themselves. In this manner the blood is returned by vessels that are much better supported amongst the deeper tissues, and it is propelled to some extent by muscular contractions, and possibly also by arterial pulsation when venæ comites lie on either side of an artery upon unyielding fascia. The stress of the embarrassed circulation is transferred from the skin, the ulcers obtain a fair chance of taking on a healthy action owing to functional rest of the part and improved nutrition, and they really do heal and cicatrise firmly. Another advantage is that eventually all external supports such as bandages, elastic or silk stockings, laced leather leggings, &c., can be dispensed with. In a hot and steamy climate, where all forms of bandage or artificial support prove so irksome to the patient's comfort and convenience, this is a

matter worth considering.

On the 4th of July, 1895, I performed the operation by circular incision for the first time, and on the 13th of November, 1895, I showed three patients (five operations, on both legs of two men and on the right leg of the third) treated in this manner at a meeting of the Calcutta Medical Society. ⁽⁴⁾ On that occasion I remarked:- "The scope of the operation appears to me to be limited to severe and obstinate cases, because there are numerous less drastic methods better adapted to the simpler cases." After a more extended experience I feel inclined to modify this opinion, and to apply the operation to cases in which there is no ulceration, even to fairly recent cases, and especially to cases in which the deep veins are not involved. In conclusion I said:- "To form a correct opinion of the value of this method, it would be necessary to see the patients a year after operation, - no easy matter in the case of hospital patients, especially sea-faring men, such as these three are."

(4)
Ind. Med. Gaz.
Dec. 1895,
p. 488.

Technique of the Operation.

It is preferable to keep the patient in hospital for a week prior to operation, so as to allow of his becoming accustomed to hospital life and to the irksomeness of remaining strictly in bed for about three

weeks after operation with the foot of his bed elevated; so as to cleanse the skin of the leg thoroughly, and so as to render varicose ulcers - if present - as healthy as possible with a boric or zinc lotion dressing.

During operation it is unnecessary to apply Esmarch's elastic band, or any constriction above the site of operation, with a view to rendering the veins more prominent. In fact such a procedure only causes trouble by promoting free hæmorrhage from the veins. The incision should be a clean cut, circular sweep exposing the deep fascia. It is not advisable to penetrate this aponeurosis, because the muscle would bulge out, and the support to the deep veins, afforded by an intact, tense and inelastic casing would be lessened. However, if a vein is visible coursing beneath the deep fascia, e.g. if the short saphena penetrates this membrane abnormally low, as has been maintained by Mr. Gay⁽⁵⁾ to be frequently the case, - then it is a simple matter to incise the fascia in the vertical axis of the limb, to double ligature and divide the vein, and then to close the fascia by a suture. In selecting the spot for the circular incision it is expedient to keep away from ulcers, which occur usually in the lower third of the leg or

(5)
Lancet,
4th Nov.,
1868.

near the malleoli; it is also advisable to avoid infiltrated skin, since its vitality is lowered and union is slower in consequence. The incision should be made through sound skin in the middle or upper third of the leg, the latter by preference. A convenient situation is the "place of election," about the upper or lower level of the tubercle of the tibia, where garters are commonly worn. In certain cases this circular incision may advantageously be combined with a second ring or incision low down near the ankle, below the area of ulceration and damaged skin. Or the lower incision may be made without the upper one. If the long saphena vein is much involved in the thigh, then the "garter" incision below the knee may be associated with excision of an inch of the vein above the knee, and of another inch near the termination of the vein in the groin. The main point is that the circular incision should not be sufficiently high up for the external saphena vein to escape division, as it would do if the incision was made above the point at which it dips beneath the deep fascia.

All vessels should be seized with pressure forceps by an assistant as soon as they are divided, in order to minimise the loss of blood, which should be

insignificant. After completing the incision it is just as well to excise or snip off about half an inch of any thickened, patulous branches of the long or short saphenæ, which might otherwise project into the linear wound and prevent accurate coaptation of its edges, thus interfering with uniform healing by first intention. Any small arterial twigs may be twisted, and all the cut veins in the upper and lower walls of the wound may be ligatured with catgut. I am aware that it is again becoming the fashion not to ligature divided varices, (Ball,⁽⁶⁾ Barker,⁽⁷⁾ and Stoker⁽⁸⁾), pressure alone being relied on to arrest oozing or bleeding; but should there be any oozing from the open mouths of the cut veins, then the effused blood will interfere with rapid union just as much as thin aseptic catgut ligatures. Moreover, if there be excessive serous or sanious discharge, the dressings will need to be renewed sooner and more frequently, involving avoidable manipulation of the limb or wound. Therefore I prefer to ligature all the cut veins, and leave a perfectly dry wound, even though this somewhat prolongs the operation when from 20 to 30 ligatures may be required. The circular wound may then be closed by a continuous chromic catgut suture piercing through the whole thickness

(6)
Practitioner,
1895, p. 497,
Vol. LIV

(7)
Clin. J.,
1897, p. 117.

(8)
Dub. J. Med.
Sc., 1895.

of the skin, with more superficial stitches of horse-hair where necessary. A dry antiseptic dressing should be applied in quantity sufficient to make the first dressing last about 10 days, by which time the wound will be practically healed. To lessen the blood stream in the superficial veins below the garter wound, and thus to favour coagulation in, or obliteration of these vessels, elastic pressure may be employed. An Esmarch's or Martin's elastic roller may be lightly adjusted for 24 - 48 hours, or from the first the foot and leg may be enveloped in cotton wool and a flannel roller bandaged on from the toes upwards. Another essential measure is to apply a posterior leg splint before the patient is removed from the table, and to keep this on all the time he is in bed. It is most important that he should not put his feet to the ground during the first week or two. Had this been done in all my cases I believe the results would have been better in some of them. A McIntyre's or Macewen's splint may be substituted, and the foot of the bed should be raised on blocks, or the limb may be slung on a Salter's cradle.

Objections to the Operation.

Numerous objections may be urged against this method of operating, but I think they can be satisfactorily met, and shall now endeavour to dispose of them.

1. It has been stated on very good authority that operative measures should be deferred until the oedema, induration and ulceration of the skin have been got rid of. This appears to be putting the cart before the horse, because the operation is done specially with a view to remedy an otherwise obstinately unhealthy condition of the skin and subcutaneous tissues of the leg. It is analogous to the principle of those physicians who defer administering quinine until the supervention of a period of apyrexia,-a condition which does not occur in some malignant malarial cases without the use of some form of quinine. Consequently the patient may die while the physician is waiting for the favourable opportunity of giving the drug. Mr. Pearce Gould⁽⁹⁾ is of opinion that:- "As a rule, to which there are few exceptions, chronic oedema,

(9)
Heath's
Dict. of
Pract. Surg.
Vol. II.

or induration, or ulceration of the skin and sub-cutaneous tissues, is a bar to operation." Mr. Watson Cheyne,⁽¹⁰⁾ after stating that " Varicose ulcer depends on varicosity of veins, especially of the smaller veins of the skin," proceeds to formulate the rule that you must heal the ulcers before you operate on the varicose veins which he regards as their causal factor. His own words are:-

"The varicose ulcers must be treated on the lines already laid down, and as soon as the sore has healed, either of itself or preferably by skin grafting, the cure of the varicose veins themselves by operation must be carried out. This operation must be delayed till the sore has healed, otherwise, if there be any sepsis, the wounds might become infected, and very serious results might follow. "

(10) Treves' Syst. of Surg., Vol I.

I have some brief notes of a case that came under my observation, though not under my charge, which is an instructive example of a medical man pursuing this Fabian policy to an extreme degree, since the patient died whilst he was trusting to Nature, and rest and medicaments for the cure of varicose ulcers.

Mrs. S. M., an Englishwoman 74 years of age, 35 of which had been spent in India, was admitted into a certain hospital on the 3rd July, 1895, for the treatment of large, unhealthy varicose ulcers on both legs, two on the right and one on the left, over the shins and about the ankle. Five years previously she had been treated in another hospital for the same disease, and had been discharged "cured" when the ulcers had healed; but they speedily broke out again when she commenced to walk. Since then she had suffered from varicose ulcers off and on, and was treated as an out-patient at various hospitals or dispensaries up to the time of her second admission. She remained in hospital quite bed-ridden for a period of nearly three years, until her death on the 20th May, 1898. No operation was performed; but the routine treatment of rest in bed, lotions and ointments, strapping and bandaging, was adopted without any real practical benefit. It is possible that if the "garter", or some other operation, had been performed she might have been rendered fairly active and comfortable during the last eight years of her life.

"Expectant" treatment proved a signal failure.

Hodgson's⁽¹¹⁾ opinion, printed as far back as 1815, seems to me far sounder. After alluding to the intractable nature of this variety of ulcer he goes

on to say:- "But if varicose veins are treated and relieved, then varicose ulcers are as readily

cured as any others." Mr. Maylard⁽¹²⁾ puts the

matter tersely:- "So soon as I have reason to

believe that the ulcer is a healthy healing wound,

the matter of operation is considered." Mr. Spence

⁽¹³⁾ has stated the case very clearly:- "In cases

of varicose ulcers, the first thing to do is to get

rid as far as we can of the varicose condition of

the veins of the limb: without doing this we cannot

expect to cure the ulcer, and in such cases the

radical method of obliterating the veins principally

affected is of great value." Bowlby⁽¹⁴⁾ also re-

marks concerning varicose ulcer, that "this once

formed, will tend to progress so long as the abnor-

mal conditions of the circulation which produced

it continue to act." Dunsmure⁽¹⁵⁾ notes that the

varicose ulcer is "exceedingly difficult to heal

as long as the cause continues," and again, "even

after cicatrisation it reopens if the causes per-

sist."

(11)
Diseases of
Arteries and
Veins,
p. 537.

(12)
Gl. Med. Jr.,
1892, p. 182;

Braithwaite,
Vol. cv.,
p. 248.

(13)
Lectures on
Surgery, Vol. 1,
p. 266.

(14)
Surg. Path.
and Morbid
Anat.,
p. 217.

(15)
A Probation-
ary Essay
on Varix.

2. It has been urged that closure of some of the superficial veins of the leg only throws the strain on other superficial veins; and in like manner obliteration of the saphena, or of all the superficial channels, merely tends to make the deep veins varicose, or to make them worse if they are already diseased. Theoretically this argument appears valid at first sight, and militates against the propriety of undertaking any form of operation on subcutaneous veins for the cure of varix; but the comparison between superficial and deep veins amounts rather to an analogy, for the two sets of vessels are not homologous. The veins lying in and between muscles, fascia and bones, are much better supported, and they derive the advantage of muscular contraction in accelerating the venous current. Moreover, the increased volume of blood conveyed by the deep veins, when the superficial are obliterated, need not necessarily retard the venous flow upwards, it may even assist in the return of the blood by augmented pressure. Because the full effect of muscular compression, in propelling the venous circulation, can be brought to bear on the deep veins when the safety-valve or complementary function of the superficial veins has

been abolished by their obliteration. Again, it does not follow that the greater volume of blood must tend to varicosity of the deep veins, it may result in producing only dilatation, i.e. by increasing their calibre they adapt themselves to altered circumstances. All veins can hold much more blood than usually courses through them, in fact the capacity of the venous system can accommodate the whole volume of blood in the body. Finally, there remains the practical test of experiment and results, for we find that no increase of suffering supervenes on closure of the superficial channels: indeed, the reverse is the rule, the patient is much relieved and the condition of his leg is improved, chronic ulcers heal and do not tend to break out afresh, and the skin assumes a healthier aspect.

As Mr. John Duncan⁽¹⁶⁾ says:- "There is a long step between varicosity and simple dilatation," and, "deep-seated varicosity is rare, and is not a result of ligature of superficial veins." "When one vein is obstructed, another dilates, and there is no tendency to varicosity, e.g. the veins of the uterus dilate to accomodate and carry more blood, when they are sufficiently dilated the pressure is

(16)

B. M. J.,
Vol. II., 1881,
p. 37.

reduced to normal." Again:- "The veins of the leg dilate because there is obstruction , not because they have to carry more blood."⁽¹⁷⁾

(17)
Ed. M. J.,
Feb. 1886.

"It has been urged that to do so (obliteration of diseased trunks) is to throw a greater strain upon other channels. But it has been already shown that a demand merely for conveyance of a larger quantity of blood is met easily by simple dilatation, and does not tend to produce varix. Practically, moreover, experience coincides with the true pathology."⁽¹⁸⁾

Maylard⁽¹⁹⁾ puts aside the objection, that deep-seated pain may result from enlargement of the deep veins when the superficial no longer return the blood, by asserting it is "largely theoretical".

(18)
Ed. Med. J.
April 1886,
p. 905.

(19)
loc. cit.

Bennett⁽²⁰⁾ also lays stress on "varicose" and "dilated" veins being distinct expressions. "A dilated vein is not necessarily varicose," - "Varicosity and dilatation are not necessarily synonymous." Also:- "A varicose vein is then absolutely distinct from a vein simply dilated from backward blood pressure or increased tension from any cause."

(20)
Lancet,
5.v.94.

In spite of all this argument and array of authorities, I must confess that there are cases in which the "garter" or any other operation may do no good, if not positive harm. There are cases in

which the chief stress of the disease is on the deep veins, and when the deep veins are unable to convey their own usual current satisfactorily it is unreasonable to burden them with the superficial venous circulation in addition.

3. Any objection on the score of risk may be discounted by the exercise of ordinary care in the details of asepsis and antisepsis. In the pre-antiseptic era there was very obvious danger in any cutting operation on veins; but now this, or any other operation for varix, is just as safe as other varieties of operation of similar magnitude. As Dr. Bennett⁽²¹⁾ remarks:- "Fortunately, the recent advances in surgery, thanks to the better appreciation of the antiseptic system on the one hand, and improved methods of operating on the other, have so revolutionised practice that any surgeon possessed of ordinary dexterity is now in a position to advocate, in appropriate cases, this radical treatment, as being more certain and far-reaching in its results than any other method, whilst it presents at the same time, under ordinary circumstances, no appreciable risk beyond that which is connected with the administration of the necessary anaesthetic and the making

(21)
Clinical
Lectures on
Varicose
Veins of the
Lower Extrem-
ities,
p. 76.

of a clean cut wound through the skin."

4. It may be urged that the operation is objectionable on the score of severity, and that a circular incision over a foot in length is unnecessary. The reply to this is that the operation is undertaken for a serious morbid condition, and frequently for cases of long-standing, in which numerous remedial measures have been previously tried in vain. The severity is trifling as compared with the gain to the patient in relief from a tedious and distressing complaint. Besides, the length of the incision is nothing to that made by some surgeons for the extirpation of single veins, e.g. Dr. John O'Connor⁽²²⁾ reported that, "In a recent severe case I removed 26 inches of the internal saphena, and certainly the blood lost did not exceed two ounces." Nor does the length of the garter incision exceed the aggregate of multiple incisions for ligature by the "open" method in some cases. In case XI the sum of the multiple incisions amounted to $13\frac{3}{4}$ inches, while the circumference of the leg measured 12 inches at the level of the tibial tubercle, which is commonly the site of the garter operation.

5. Interference with the cutaneous sensibility of the limb below the knee. This objection is valid

(22)
Annals of
Surgery,
April, 1897,
p. 526.

merely for a time, for the anaesthesia is temporary and only complete over a limited area. In the course of a couple of weeks the sensation gradually returns, and is completely or largely restored by the end of a month. This subject will be more particularly dealt with in the description of the cases operated on.

Supposing the garter operation is performed about the site of election, then the cutaneous nerves divided are:-- The internal saphenous nerve anteriorly and internally; lateral cutaneous of peroneal nerve externally and posteriorly; obturator and internal cutaneous nerves internally and posteriorly, and the small sciatic nerve posteriorly. The external saphenous nerve would be cut posteriorly in the event of its piercing the deep fascia at a high level, or if a circular incision be made about the middle of the calf. Even if the circular incision be made almost down at the level of the malleoli the distribution of the musculo-cutaneous branch to the foot will escape division, as also the external saphenous and anterior tibial supply to the toes, and the calcaneo-plantar, internal and external plantar nervous supply of the sole and heel.

In what manner the restoration of sensation is effected I am not in a position to state; but I do

know that it occurs. It may be by reunion of the meshes of the fine nerve-network in the skin and cellular tissue, or it may be sensation is regained by means of the uninjured cutaneous branches lower down, i.e. by a process of anastomosis analogous to the collateral circulation after ligature of an important blood-vessel.

6. Swelling or œdema of the leg after operation.

This is a more serious objection in many cases. Any patient who has been kept strictly in the dorsal decubitus for some weeks with an injured leg suffers from congestion or œdema of the limb. This is an every day occurrence after the union of a fracture of the lower extremity. So it is with a patient operated on for varix, who has had his heels raised higher than his head for two or three weeks, when he begins to put his feet to the ground. This soon wears off, though it is good to give support by bandaging the limb for some time after the patient commences walking. Still I have seen cases in which the swelling of the leg was of a more obstinate character and required more attention. In a few instances I attributed it to the patient disregarding instructions by getting out of bed on the sly during the first week after operation. Consequently too great a strain was put on the deep

vessels before they had time to adapt themselves to convey a larger quantity of blood, and the superficial veins below the incision were opened up by the blood coursing into them before obliteration was complete. Another possible cause of œdema occurs when the circular incision is incomplete either in depth or in circumference, i.e. when it forms only three-quarters of the circle, and a strip of skin remains uncut. In such circumstances some of the venous blood is returned by cutaneous channels, the principle of the operation is vitiated, and the result is incomplete cure and inconvenience such as swelling of the leg. Unsatisfactory results are apt to happen when half measures are adopted. But, apart from all these contingencies, there may be cases in which the varicosity and valvular incompetence of the deep veins are already too far advanced for them to bear the added strain of conveying the blood which previously coursed through the superficial system of veins. This is, however, exceptional, and it must be left to the experience of the surgeon to judge when it is best to leave well alone a case beyond his art. The symptoms of incipient and advanced varix of the deeper veins of the leg are fairly well known, and have been described by Dr. Bennett. (23)

(23)
op. cit.,
pp. 28-34.

7. Relapse. As to the question of recurrence of varix or its sequelæ after this operation, which aims at a "radical cure," I regret I have been unable to apply this crucial test so fully as is desirable; but in two cases I saw the patients about 8 months and 1 year after operation. Following up cases after operation is often no easy matter in hospital practice. This difficulty is doubly enhanced in India where the European population is so migratory, and where the exigencies of the public service entail numerous changes of appointment and transfers of station on officials in every department of Government service. M. Remy⁽²⁴⁾ has justly animadverted on "the lamentable want of evidence as to the question of relapse. Surgeons record their operations by the fifty without giving any record of the case after the patient first leaves the hospital, two or three months at the outside after operation. No case, he thinks, ought to be considered as evidence of any operation benefit which is not free from relapse for at least two years."

Cases operated on by the Circular Method.

I shall now proceed to give details of the operation cases of which I happen to have retained any notes. This series does not comprise nearly all the

(24)
The Medical
Chronicle,
May 1897,
p. 124.

cases I have operated on by the circular method, and in some instances the notes available were condensed or fragmentary. To save repetition I may here mention that all the following cases were admitted to my wards in the Presidency General Hospital, Calcutta. It may also be stated that the first three cases were shown at a meeting of the Calcutta Medical Society, and unqualified satisfaction was expressed by the members present at the results obtained.

1st Series.

Case 1.

Bilateral
operations.
One circular
incision
below knee
through
sound skin,
the other in
middle of
calf through
altered skin.
Ulcers

scraped.

W.I., æt. 63, British, cook of the ship "Grecian," was admitted on the 26th June, 1895. His statement is to the effect that he has had varicose veins of the legs since he was a lad of 17; the discolouration over the shins commenced a couple of years ago, and the ulceration began during the last six months. It is over seven years since he was run over by a luggage trolley at King's Cross Station, and sustained fractures of both bones of both legs, that of the left tibia was compound and has resulted in considerable deformity of outline of the shin. He was treated at the Royal Free Hospital.

Condition on admission. An advanced case of varix of both legs, the skin being extensively affected from

the ankles to near the knees. On the right leg there were two ulcers on the shin and one about the inner malleolus; on the left leg one ulcer over the outer malleolus, and two over the shin, the lower of the latter was an extensive and very troublesome sore on the prominent projection of the tibia.

First Operation, 4th July, 1895.

A circular incision down to the deep fascia was made high up in the right leg, below the knee and a couple of inches above the infiltrated area. A dozen ligatures were applied, and the wound was closed by horse-hair sutures. The varicose ulcers were scraped with a Volkmann's spoon, and dressed daily. On the 5th day the incision wound was dressed for the first time, and primary union was going on most satisfactorily. Small skin grafts were applied to the ulcers on the 14th July, and they were soundly healed at the end of the first week in August, i.e. about a month after the operation.

Second Operation, 17th July, 1895.

A similar operation was performed on the left leg, only the incision was made at a lower level, - at the junction of the upper and middle thirds of the leg, through the thickened and pigmented tissue containing tortuous and dilated veins. A large

ulcer, just over the site of the irregularity, caused by faulty union of the tibial fracture, was scraped and the adherent skin was dissected up to free it from the subjacent bone. The first dressing was done on the 6th day, when the incision wound was found to have united. Two of the ulcers healed fairly rapidly; but one proved most obstinate, chiefly owing to its situation over the old fracture and the low vitality of the adherent and infiltrated skin. It was not until the fifth attempt that skin grafting succeeded. On the first occasion numerous small, fresh grafts from another patient were used; the second time large skin grafts from a freshly-killed mouse were applied; thirdly, a large graft was taken from his own thigh; and fourthly, small grafts, taken from a piece of his own skin that had been preserved in dilute spirit, were employed. For over a week it seemed as if these grafts would take, but finally they were cast off. I thought I should be compelled to dissect up the base of the ulcer, and to chisel off a portion of the tibial prominence before the ulcer could be given a fair chance of healing. However, I gave it a fifth and last chance by applying several small, fresh skin grafts, and by careful dressing with my own hands. This ulcer was finally and firmly healed by the middle

of December, 1895.

The anaesthesia did not last long. When he first got out of bed he experienced a feeling of tightness, or constriction at the lines of incision. For some time he suffered from oedema of the legs and ankles after walking; but all these symptoms rapidly disappeared when the deep system of veins had adjusted itself to the extra work thrown on it. My note of the 20th January, 1896, was:- "Excellent recovery, no appearance of varicose veins, no oedema". He came to show himself on the 22nd February, when I saw him for the last time, 7 months and 20 days after the first operation. Then, the scar tissue in the situation of the former ulcers was firm and evinced no tendency to break down; the subcutaneous veins seemed obliterated, and all projecting varicosities had disappeared; there was no anaesthesia, no oedema, nor other inconvenience. The general appearance of the skin of the legs was vastly improved, and the patient expressed himself well pleased with the result.

From this case I learned that:-- (1) It is more convenient to scrape the ulcers before making the garter incision. If the ulcers are left till after the veins are cut and tied, then the increased venous pressure may cause troublesome oozing from the ulcers

when they are scraped. With ordinary care there need be no risk of sepsis from the ulcers being first dealt with. (2) It is easier and probably better to make the circular sweep through the sound skin in preference to incising the tough, thickened and profoundly altered skin with its rigidly fixed and adherent varices. (3) One must not expect the veins to take on their extra work immediately, time must be allowed for the venous circulation to accustom itself to the altered conditions.

It is possible that the worst ulcer would have healed readily if I had chiselled away a little of the tibia in the first instance; but I did not consider any interference with bone desirable in this rather feeble old man, and in a case where there might be a possible chance of sepsis from the superjacent ulcer. Besides I wished to test the efficacy of this mode of operation to its utmost. If such an unfavourably circumstanced ulcer could heal after the circular incision, - then it argued well for the healing of any varicose ulcer by a similar procedure.

Case II.

G.D., æt. 47, British seaman from the ship "Trade Winds", was admitted for treatment of chronic varicose ulcers of both legs. He has suffered from varix

Bilateral
garter in-
cisions be-
low knees.
Ulcers not
scraped.

for the last 26 or 27 years; pigmentation and ulceration have been developed during the past 10 years.

First operation, 19th September, 1895.

The left leg was operated on, a dozen ligatures were applied, and the circular incision was closed by interrupted horse-hair sutures. The first dressing was done a week later, when nearly all the wound was found healed.

Second operation, 7th October, 1895.

A similar operation was performed on the right leg, 10 ligatures were used, and the edges of the incision were approximated by a continuous catgut suture, which was removed on the 14th October, when the wound was practically healed.

This patient rapidly recovered sensation below the garter incision; but he felt some tightness at and below the scar lines for a week or two. The result was most satisfactory, both as regards the veins and the healing of the ulcers. He was last seen $4\frac{1}{2}$ months after the first operation. At that time both legs were soundly healed, and not a single varicose vein was visible below the garter incisions; but some veins appeared slightly enlarged a little above the circular incision in the left leg.

(1) The continuous suture was an improvement on the

numerous interrupted stitches, so also was the avoidance of scraping the ulcers with a Volkmann's spoon. When the veins are effectively dealt with by any form of operation the ulcers will heal readily.

2. It will be noticed that I have not described in detail the condition of the legs; but this is owing to my having only the notes of the case as written for the Calcutta Medical Society. At the meeting I was able to show the members the patient, and to demonstrate the number and situation of the healed ulcers, hence no written description was needed. My recollection is that it was an advanced case of varix, with marked pigmentation and obstinate ulcers on both legs.

Case 111.

C.E., æt. 44, British, blacksmith and donkeyman on board the steamer "Holkar," was admitted for a varicose ulcer on the external malleolus of the right leg. He had suffered from varix in this leg for 20 years, and said it had always been weak and inclined to swell ever since he had typhoid fever at 17 years of age. On admission, scars of former ulcers were visible on the right leg, as well as a varicose ulcer with inflamed base and sloughy surface over the external malleolus. Both saphenæ showed knots and phleboliths, with numerous branches enlarged, tortuous, prominent

Circular
incision
below right
knee.
Ulcer over
outer malleolus.

and thickened by a deposit of connective tissue.

Operation, 2nd October, 1895.

The same garter incision was made in the upper third of the leg, 20 ligatures were applied, and a continuous suture of chromic catgut. The leg was dressed on the 6th day for the first time, when a good part of the incision had united; but it did not close entirely until the 20th October. The ulcer was healed on the 25th October. Next day he was allowed to walk a little, and complained of some tightness of the skin below the incision. He was discharged "cured" six weeks after operation, at which time the leg seemed most satisfactory in every way. As he rejoined his steamer I had no further opportunity of following up his case.

Case IV.

Control experiment. Varices and ulcers on both legs, but right limb only operated on.

Though this case was treated at a much later date, yet I insert it here as an example of a control experiment on the garter method for varix with ulcers of the legs. Both legs were equally affected and both had the same chance of benefit from rest, elevation of the feet, bandaging, antiseptics, soothing, stimulating or astringent dressings: but the right leg was operated on, and the ulceration healed readily and permanently; whereas the left leg was not operated on, and the ulcers per-

sisted, alternately tending to heal and break down.

J.P., alleged age about 50 but looked older, a Dutch seaman, ss. "Gulf of Lyons," was admitted on the 30th May, 1897, for the treatment of two naso-orbital fistulæ, varix and ulcers of both legs and an old inguinal hernia.

Previous History. Scurvy 8 years ago, accompanied by extravasation, petechiæ and inflammation in the legs, followed by ulcers which healed as the scurvy disappeared. He dated the commencement of ulcers on his legs to this period, though the varix was of much longer standing. Yellow fever 6 years ago. About 2 years ago he was severely frost-bitten while standing at the wheel in a blizzard, resulting in injury to his right hand and in the loss of his right eye, which was enucleated at Brooklyn Hospital. The present ulcers on his legs he ascribed to striking them against spars and hatches during his recent voyage.

Condition on admission. A battered old seaman, who had spent his life at sea, and looked prematurely aged by hardship and privation. He had a foul tongue and poor appetite, was subject to constipation, and sleepless from pain in the orbit and legs. Heart sounds soft and feeble. Both legs were tender, swollen and painful. Over the lower third of the shins there

were scars and chronic ulcers of the varicose type, with hard raised margins, unhealthy granulations, and a dirty discharge. Marked varix of both legs, the veins prominent, knotty and dilated in the calves, fixed and depressed in the indurated skin over the tibia. Both internal saphenæ were thickened and enlarged, especially the right one which was most affected high up near the groin. The skin was much pigmented, adherent, indurated and oedematous, with thin scar tissue here and there as the remains of former ulcers. The femoral lymphatic glands were tender and enlarged, owing to absorption from the dirty ulcers on the shins. Over the right tibia, a hand's-breadth above the malleoli, there was a painful ulcer 2" x 1½", with its edges and base adherent to fascia and bone. The right shin was painful up to the knee, and the pigmentation extended upwards from the ankle for over 12 inches. The left leg was similar, except that it was not quite so painful, also there were two smaller ulcers on the shin in place of the single, larger and more inflamed one on the other leg. During the first 10 days the ulcers became clean, and his general health improved.

Operation, 10th June, 1897.

The usual garter incision was made on the right

leg $1\frac{1}{2}$ " below the tibial tubercle. Only 8 ligatures were needed, as there were not many veins to tie at this level; but such as there were showed a patulous lumen, with thickened, tortuous, non-collapsible walls. Continuous catgut and interrupted horse-hair sutures were applied, also a straight splint to keep the leg extended and at rest. No attempt was made to dissect up the edges of the ulcer, or to scrape the granulations on its surface. This point deserves notice, because such procedures are unnecessary for the healing of varicose ulcers after the garter incision, since the resulting changes in the skin and circulation prove sufficient.

15th June. First dressing on the 6th day. Catgut suture removed as it was loose, having been absorbed in parts. Circular incision seems to be healing well, and ulcer nearly healed. Anaesthesia of the leg, but no interference with sensation of foot and ankle. Splint and dressing re-applied.

24th June. Second dressing on the 15th day. Wound completely healed. Horse-hair sutures removed. Ulcer firmly healed, whereas the ulcers on the left leg (not operated on) persist, though they have contracted a little and are much healthier. Anaesthesia remains on the front and inner side of the leg from the

incision to near the ankle, chiefly in the area of the internal saphenous and peroneal cutaneous nerves; but sensation is now perfect on the back of the leg throughout, over the cutaneous distribution of the internal cutaneous, obturator, peroneal and external saphenous nerves. This looks as if sensation was being restored to the peroneal cutaneous posteriorly through its terminal communications with the other nerves just mentioned, whilst anteriorly it still shared the fate of the internal saphenous nerve. The numb area gradually disappeared. On the 2nd July the ulcers on the left leg were three-fourths healed; but they broke down again by the 17th of the same month, at which time there were three sores in place of two. One was large, about two inches square, and the other two were round and deep with some feebly organised tissue intervening. The discharge from them was copious and they tended to bleed, chiefly during the night. During August they again began to contract; but one ulcer remained open on the 27th September. The hospital notes contain no subsequent mention of it, so it is presumed that the left leg had healed completely when he left hospital.

All this time the healed ulcer on the right leg

showed no tendency to start afresh, and it continued firmly healed when he left hospital on the 1st November, 1897, nearly $4\frac{1}{2}$ months after operation.

At the beginning of October, 1897, I was recalled to military duty on account of the Tirah Expedition, so I did not see the end of the case; but I observe from the notes that there was some oedema of both legs during October, which, however, had nearly passed off at the time of his discharge, when he was pronounced to be "progressing well".

As an example of a control experiment the notes of this case have been more fully given, perhaps with too much prolixity, so I omit all details of the plastic operation on the orbit, and of an attack of prostatitis and cystitis from which he suffered in September, since they are not germane to the subject under discussion.

This case shows that the ulcer on the right leg healed firmly and well within a fortnight of the operation on the cutaneous veins, whereas one sore on the left leg persisted quite three months later. It also shows that the equilibrium of the deep venous circulation was not quite restored 4 months after operation, for the right leg tended to swell like the left one. Still it was immensely improved as compared to its former condition.

Case V.

Varix of both legs, but no ulcers. Garter incision on left leg.

G.C., aet. 20 years, British seaman, ship "County of Selkirk," was admitted on the 16th of November, 1895. He had varix of both legs, but the veins in the right leg were not so markedly affected and gave no inconvenience. Whereas he suffered pain in the left leg, especially at night. The skin was not affected; but large, very tortuous, sacculated veins existed in the left calf. He ascribed the condition to a blow from a cricket ball in boyhood.

Operation, 23rd November, 1895.

The circular incision was made round the upper part of the left calf, about the level of the tibial tubercle, 8 ligatures and a continuous catgut suture were applied.

29th November. First dressing, primary union.

9th December. Sensation perfect below incision.

16th December. The tortuous and dilated veins below the incision are gradually disappearing. He has no feeling of tightness or other inconvenience.

23rd December. The skin and veins appear quite normal. Discharged 1 month after operation, and not seen again. He did not wish anything to be done to his right leg, because it gave him no trouble and because he did not wish to spend Christmas in hospital.

This patient was much younger than any of the pre-

ceding, the disease had not existed long enough for the skin to become affected, nor did the deep veins appear involved. The prognosis was favourable; but it would be interesting to follow up such a case to see if the disease progressed in the right leg as in the other cases, to ascertain whether the superficial varix was permanently arrested in the left leg, or whether the deeper veins succumbed to varix with advancing age.

Case VI.

2nd Series.
Varix of
right leg,
no ulcers.
Long saphena
doubly lig-
atured in
groin, garter
incision and
a circular
incision at
ankle.

L.B., æt 24, French seaman, ship "Ganges", was admitted on the 18th December, 1896, for the relief of irritation caused by salt entering the conjunctival sac. While in hospital he requested to be operated on for varix of the right leg, because he experienced much inconvenience and suffered from a dull, heavy pain which became aggravated at times, assuming a throbbing or a lancinating character.

Condition of the right leg prior to operation.

The long saphena was very prominent and dilated below the saphenous opening measuring $1\frac{1}{2}$ " across. The rest of the vein was as thick as the index finger down to the knee. All round the ankle and foot the skin was injected with indigo-blue venules. The

veins of the dorsum of the foot were tortuous and projecting, and there was a very large vein crossing the tendo Achillis. Over the inner and back part of the calf there was a mass of huge, knotted veins, in area as large as a man's hand. The condition commenced when he was about 10 years of age and it had gone on increasing ever since. There were no ulcers or pigmentation of the skin.

The case answered to Mr. Bennett's⁽²⁵⁾ description of "subcutaneous (as distinguished from 'Subfascial') varix at the saphenous opening," due to valvular defect of the "distal upper saphenous valve," which lies superficial to the cribriform fascia.

(25)
op. cit.,
pp. 37, 39.

Operation, 30th December, 1896.

1. The right long saphena was ligatured in two places, with an interval of an inch between, near its upper end. 2. A garter incision was made at the level of the tibial tubercle. 3. Another circular incision was made just above the ankle. Double ligatures were applied to all the veins cut across. The leg was bandaged and put up on a McIntyre's splint.

10th January 1897. Second dressing of wound in thigh, incision healed. First dressing of circular incisions at knee and ankle. There was primary union of both

wounds, except for about an inch just over the internal saphena, where healing was interfered with around the cut ends of the vein, in the upper wound by a collection of blood-stained serum and in the lower by some clear serum. The continuous catgut and interrupted horse-hair sutures were removed. A straight splint was substituted for the McIntyre. There was anaesthesia between the circular incisions, which contrasted markedly with the normal sensation in the thigh and foot. There was no oedema, no pain, nor other discomfort. At the third dressing on the 16th January all the wounds were healed, and a few days later he was walking about as usual.

2nd February. Sensation was not yet restored between the incisions, though it was beginning to return. Very slight oedema of the leg was observed. The long saphena in the thigh was small, hard, cord-like and occluded. No veins were visible in the leg, except a few, hard knots on the back of the calf, in the place of over-dilated valves and sacculations. He was discharged at his own request two days later, 37 days after operation. The result appeared most satisfactory.

Case VII.

Varix of both legs, ulcers on left leg. Garter incisions on both legs, and incomplete circular incision at right ankle.

H.A.P., æt 49, German, steward on ship "W.I. Pirrie", was admitted on the 29th March, 1896, for varix of both legs and three painful ulcers on the left leg.

Condition on Admission. Left Leg. Pigmentation and

induration over the lower third, also the scar of an ulcer on the shin. Prominent varices in the foot and leg, most pronounced all round the middle third, one large ulcer over the fibula above the external malleolus, another below the latter and a third over the tendo Achillis. Right Leg. A large cicatrix, the result of a burn 12 years ago, on the lower third of the shin and adjacent parts; extensive pigmentation of the skin. Big, knotted veins all round the lower half of the leg, especially on the inner side.

*

Operation, 17th April, 1896.

Left Leg. (1) Circular incision in the upper third. A great many large, tortuous, dilated veins were cut and ligatured, part of the external saphena was excised, as it was much thickened. A continuous thick catgut suture, and interrupted sutures of thin catgut were used. Ulcers dressed separately.

Right Leg. (2) A similar incision and similar sutures in the upper third of the leg. A great many

veins cut and tied, and part of one excised. But the veins were neither so large nor so numerous as in the other leg. (3) In addition, two incisions were made over the front and back of the ankle above the malleoli (incomplete circular incision) to secure varicose veins low down, and so as to include the main mass of knotted veins in the middle of the calf between the high and low incisions.

The wounds did not heal readily owing to various causes. The patient developed an attack of asthma a couple of days later, and had several subsequent attacks. Altogether he proved a bad surgical subject. He was fractious, obstinate, would not obey orders, and got out of bed frequently even during the first days after operation. He would not wear any splints, refused morphia and other remedies, and proved intolerant of iodoform; and the coarse catgut caused irritation from its bad quality. There was much serous discharge from the ulcers. The legs became swollen, oedematous and inflamed, owing to his walking before the deep veins had time to accommodate themselves to the increased venous flow through them. He suffered much pain in the legs in consequence of his restlessness, and the upper circular wound in the right leg, as well as part of the left garter incision, broke down from the same cause.

25th April. One ulcer healed and the others nearly closed; but some swelling about the ankles.

1st May. All the ulcers healed; but the left garter incision was not completely closed until the 28th May, and the right one not until the end of the first week in June, though he was walking about long before this. Tendency to congestion and swelling of the legs, with hardness over the calves when standing. Sensation returned early in June.

When he left hospital on the 24th June, 69 days after operation, his condition was as follows:-

Left leg: No œdema, no hardness, no pain, no anaesthesia, and the skin much healthier in appearance. Incisions and ulcers firmly healed. Two or three prominent veins over the shin. Right leg: It tends to swell on walking or standing long unless he wears a bandage. Partial anaesthesia over tibia in the area supplied by the internal saphenous nerve; but sensation normal on the inner and back parts of the calf supplied by the same nerve, it having been probably restored through the adjacent external saphenous nerve and its communicating filaments. The veins are prominent over the shin around the cicatrix of the old burn. The upper and lower incisions firmly healed. Finally I summed up thus:- "The right leg is doing fairly well, but is not nearly such a good result as in

the other cases." It is curious that the left leg, which was really the worse, should have proved the better result two months after operation. Much more time, however, is necessary before pronouncing a final opinion. In the course of a year or two the ultimate result would probably be equally good or equally bad in both legs.

Case VIII.

Varix of left C.E., æt 54, British seaman, ship "Scindia", was ad-
 leg, no ulcers.
 Short excisionmittted on the 9th December, 1895. In 1859 he fract-
 of long saph-
 ena in groin, ured the left femur about the middle of the thigh
 followed 26
 days later by (probably a compound fracture), and was treated at
 garter inci-
 sion.
 Charing Cross Hospital. Union occurred with a good
 deal of deformity. Next year, 1860, he observed the
 veins of his left calf enlarging. Gradually all the
 veins of the leg and foot have become varicose. The
 internal saphena is very much dilated and thickened all
 up the thigh. He suffers a good deal of pain in and
 around the veins of this leg. A very advanced and
 well marked case of varix of the left thigh, leg and
 foot, - probably caused by obstruction to the venous
 circulation from excess of callus and the deformity
 of the badly united fracture. The internal saphena
 and the enormous knotted veins at the back of the calf

are very prominent; but there is no pigmentation or ulceration.

First operation, 19th December, 1895.

Excision of $1\frac{1}{2}$ " of the left long saphena, and double ligature, near its termination at the saphenous opening. The dressing was changed next day, owing to the patient having soiled it. The veins of the leg seemed much smaller, hard knots could be felt in the calf.

22nd December. Pain along the course of the internal saphena. Coagulation seems to be going on satisfactorily in it, and in the main varicosities of the calf.

28th December. Second dressing on 10th day. Wound healed by first intention, sutures removed. The veins in the calf are still very apparent, but seem to contain coagula.

8th January, 1896. The internal saphena in the thigh feels smaller, hard and cord-like; but blood is circulating through the superficial veins of the calf, as is very obvious when the patient walks about. The operation has evidently proved but a partial success, only the saphena in the thigh and some knotted tributaries in the calf being blocked.

Second operation, 14th January, 1896.

Garter incision at the level of the tubercle of

the left tibia; nearly 30 ligatures applied; deep and superficial continuous catgut sutures. The internal saphena contained blood-clot, as also did many of its knotted ramifications; but other veins, the external saphena and its tributaries, were patulous, without clot, and enlarging since the stress of the superficial circulation had been put on them.

20th January. First dressing on seventh day. Primary union, except a small spot just over the internal saphena.

22nd January. Second dressing, wound healed.

27th January. No oedema, pain, or inconvenience.

6th February. All the thickened veins below the incision have disappeared; but a few shotty lumps can be felt containing clots or phleboliths. Numbness continues, and was present in the calf six days later.

14th February. Diminished sensation on the front of the leg, sensibility restored on the back of the calf.

22nd February. Slight numbness remains, and a feeling of tightness exists. The large veins on the back of the calf are almost imperceptible to sight and touch. The internal saphena is much smaller, apparently owing to atrophy of the occluded vein.

Unfortunately I have no further information of this case, because I forgot to transcribe any more

notes from the hospital records; but the result was unquestionably most favourable. The case is particularly interesting because of the garter operation being performed on the 26th day after excision of a part of the long saphena in the thigh. Thus the actual condition of this vein and its tributaries was exposed to view by the incision below the knee, and the limitations of Trendelenburg's operation high up in the thigh could be demonstrated. It appeared as if the advantages accruing to the internal saphena aggravated the condition of the external saphena and its tributaries, and it was certain that not all the varicose affluents of the internal saphena in the calf were at that period occluded. It also seems to show that the garter incision succeeded in completing what was left undone by Trendelenburg's operation. Hence the advisability, in certain cases, of combining the garter incision below the knee with excision of part of the long saphena in the thigh. In the next case the order of the operations was reversed; the garter incision was first performed, and not till a couple of months later was the long saphena divided and tied at two levels in the thigh.

Case IX.

Ulcers on right leg, varix in both. Garter incision in right leg, followed 2 months later by short excisions of long saphena at knee and groin.

C.S., æt 51, Swedish seaman, ship "Fingal", was admitted for severe diarrhœa on the 6th October, 1896. Patient anaemic and debilitated. Pain and weakness in the right leg owing to varix and varicose ulcers, left leg also affected. Till his health improved nothing was done for the legs, except rest in bed, roller bandages, and dressing of the ulcers which were slight. By the 1st November his health and strength were restored, and he was fit to be transferred from my medical to my surgical ward. At that time his condition was as follows:- The veins of the arms and trunk rather prominent, those of the thighs even more so, and marked varix in both legs. No evidence of hæmorrhoids. Right leg. In the erect posture the veins project as knotted, tortuous, enormously thick cords all round the calf, and the venules in the skin are also very apparent. The long saphena at the knee is about the thickness of a man's thumb, and near the saphenous opening it is about as thick as the middle finger. Other veins on the front and back of the thigh are also very conspicuous. Marked pigmentation over the skin from the ankle to the junction of the upper and middle thirds of the leg. Over the same area there are several large pigmented scars that

appear to be of varicose origin. In addition to these there are about 20 scars about the knee, and around, above and below the discoloured area, which are suspiciously like the results of tertiary syphilis.

Left leg. The veins of the calf are considerably enlarged and slightly varicose, but the condition is less marked than that of the other leg. The long saphena is somewhat dilated in the thigh, but does not project like its fellow.

Previous History. He went to sea when 16, worked as a seaman for 20 years, and as a sailmaker on boardship for the last 15 years. He says that ulcers appeared on his right leg for the first time about 24 or 25 years ago (possibly syphilitic), and that he first noted varix in the right leg 18 years ago in California, and in the left leg only recently.

First Operation, 3rd November, 1896.

The garter incision was made lower than usual in the upper third of the right leg; over two dozen ligatures, two dozen horse-hair sutures, and nearly a dozen catgut sutures were applied. The limb was carefully bandaged with flannel rollers from the toes to the groin, over which an india-rubber bandage was applied, and a straight back splint was put on. He

complained of the elastic bandage during the day, so it was slackened; but he still objected to it, so it was removed at night to enable him to get a good night's rest. It was reapplied next day; but it had to be taken off again at night, owing to the pain and inconvenience it caused.

14th November. First dressing on 12th day. Dressings quite dry and clean, only the deepest layer shows any stain. Primary union, except for half an inch posteriorly, where the wound gapes a little, owing to one catgut suture having given way. Numbness and partial anaesthesia for 4" below the circular incision; but no analgesia, and the lower part of the leg and foot have normal sensation.

16th November. Some swelling, pitting of the foot, and a feeling of itchiness of the leg about the level of the wound.

18th November. A clot can be felt in the long saphena half way up the thigh.

21st November. Second dressing. Veins below incision hard and knotty, as if filled with coagulated blood. Splint removed.

30th November. He walked the length of the ward, the leg and foot became cyanosed and turgid, but this soon passed off when he lay down.

4th December. Able to go up and down stairs without

other discomfort than turgidity of the foot and leg. A dull numb feeling on the front and inner side of the upper half of the leg below the incision.

8th December. Long saphena occluded for about 3" above incision, beyond which its lumen is patent and the vein is as thick as a man's ring finger. No veins visible in the leg; but great discoloration all the way up, extending several inches above the incision. This discoloration appears like that of an old ecchymosis from a bruise, and I have noticed it as a late manifestation in other cases of varix similarly treated. Considerable desquamation of the cuticle; but scarcely any numbness or anaesthesia remain, and there is no oedema of the foot unless he stands, or sits for some time with his foot down. On this account he still wears a bandage.

23rd December. All the discoloured, ecchymosed appearance has gone.

1st January 1897. After he has been walking about all day, the leg swells a little at night, but the night's rest restores it to the normal condition. The long saphena prominent and patulous, and the veins at the back of the thigh are the same: those below the incision are filled with clot, hard and shotty, this is most marked about the ankle.

Second Operation, 6th January, 1897.

Two ligatures applied about an inch apart on the right long saphena near its termination, and the vein cut between them. The vein double-ligatured and divided at the knee in like manner over the inner tuberosity of the femur. Both wounds closed with horse-hair sutures. The limb carefully bandaged from the toes to the groin, and a back splint applied.

14th January. First dressing on 9th day. Primary union of both incisions. No thickening or enlargement of the long saphena apparent.

19th January. He is able to walk about without any discomfort, and there is no swelling of the foot or calf.

22nd January. Long saphena below groin incision feels like a hard cord, lumen apparently quite obliterated. Veins in front of thigh no longer prominent. Veins on back of thigh less marked, though still conspicuous, as are also the cutaneous venules. Veins of the leg below garter incision obliterated, and original pigmentation less. Skin over shin slightly numb; but he feels anything touching any part of his leg, and feels the pain of a prick over the numb area. The leg swells very slightly if he is up and about all day long; but he has no pain now, and the slight swelling

disappears readily if he lies down. He was discharged from hospital this day at his own request; over $2\frac{1}{2}$ months after the garter operation.

I regret I have not been able to follow up this case. The result was most satisfactory, and the fact of the garter operation being first performed enabled one to see its limitations. The veins of the leg were occluded, but those in the thigh derived little or no benefit. There was an attempt for the blood to coagulate in the long saphena and other superficial veins of the thigh; but the clot soon got shrunken and absorbed, the vessels were again patent; though they were not so large and prominent as previously, owing to much of the blood now being diverted from them to pass through the deep system of veins. The division and ligation of the long saphena in the groin and at the knee completed what the garter incision failed to effect. Hence the importance of combining these two procedures when the veins of the thigh are also much involved.

The remaining series of three cases illustrates a modification of the operation, which I do not think can be recommended, except in the milder forms of varix. Firstly, because it vitiates the principle of the complete circular method, as it is really nothing but an ordinary incision with ligation of some only of

the superficial veins of the leg; and, secondly, because the results were disappointing in two of the three cases. My idea was to reduce the length of the incision, to simplify the procedure by leaving a bridge of skin, should the wound break down as in case VII, and generally to minimise the severity of the operation. For the strip of skin left uncut I selected a part where no veins were visible, which was usually the skin over the tibia. Nevertheless, enlarged veins became apparent after operation in this uncut portion of skin in cases XI & XII.

Third Series.

Varix right leg, no ulcers. Semi-circular 6" incision below knee.

Case X.

E. S., æt 22, Swedish seaman, ship "Saratoga", admitted on the 29th November, 1895, for an inguinal bubo of the right groin, which was excised on the 3rd December. After this he suffered from a recurrence of malarial fever. He had well marked varix in the right foot and calf, with knotted projections and dilations of the veins. No ulcers nor pigmentation of the skin. This leg has been affected for as long as he can remember. He says the varices become more prominent in cold weather. He suffers no pain, but desires an operation.

Operation, 23rd January, 1896.

A semi-circular incision round the back of the

leg 6 inches long, made high up near the popliteal space, from the head of the fibula to the inner tuberosity of the femur, leaving $6\frac{1}{2}$ inches of sound skin uncut anteriorly. Ten ligatures applied, also deep and superficial continuous catgut sutures.

29th January. First dressing on 7th day. Parts of the sutures absorbed, the rest loose. Primary union, except for two inches over the enlarged internal saphena.

10th February. Wound healed, some oedema of the leg, no thickened veins visible; but when he stands up a few vessels with pellet-like, hard clots can be felt.

22nd February. He has been walking about for a week. The incision scar firm, no veins visible above or below it, no oedema, sensation perfect. The leg operated on perspires more than the other.

2nd March. Everything satisfactory. Discharged on 39th day after operation.

The rapid and complete disappearance of anaesthesia points to restoration of sensation through the medium of the undivided cutaneous nerves. The slight oedema, and its rapid disappearance, may have been due to the extra work being carried on by the remaining superficial veins, or to its being shared by the deep veins, which, in either case, would not have the whole stress thrown on them. Or, again, the deep

veins may have been less affected than in the next two cases.

Case XI.

Varix right leg, no ulcers. Incomplete circular 9" incision below knee, followed a month later by multiple short excisions and ligature.

P. J., aet 27, German seaman, ship "Jumna", was admitted on the 19th February, 1896, for soft chancre of the penis. He has noticed varix in the right leg for the past 5 years. The veins of the left leg slightly varicose.

Right leg. Capillary venules conspicuous in the thigh and leg, no ulcers nor pigmentation of the skin. The internal saphena thickened and dilated, standing out like a cord from the groin to the calf, where it became involved in a mass of enlarged, tortuous, sacculated and knotted veins. It seemed doubtful if this mass, which resembled a venous angioma, would yield to a garter operation or any modification of it. I made a note at the time that multiple incisions and ligatures on all four sides, or dissection and excision of the varicose mass, combined with removal of portions of the long saphena in the groin and at the knee, would probably be the most effectual mode of treating such a case. At the time, however, my anxiety to test thoroughly the capabilities of the incomplete circular incision overcame my better judgment.

First Operation, 2nd March, 1896.

An incision 9" long was made round the leg for three-fourths of its circumference, high up just above the level of the head of the fibula and over the inner tuberosity of the tibia, leaving a strip of skin 3" wide uncut on the front of the leg. A dozen veins were cut and ligatured, the seven worst being in the region of the internal saphena, three at the back of the calf and two on the outer side. Continuous cat-gut sutures, superficial and deep.

4th March. First dressing on 3rd day owing to soaking.

12th March. Second dressing on 10th day. Wound united throughout, except $1\frac{1}{2}$ " over internal saphena, where it is granulating well. Slight anaesthesia, chiefly below and to the inner side of the incision. The knotted veins of the calf tender to the touch and still very prominent.

25th March. Wound healed.

7th April. On the 37th day I noted that the operation had failed, partly owing to the incision having been made too high up, and chiefly because it did not form a complete circle to intercept the entire cutaneous circulation. There was a prominent vein (not seen before operation) crossing the shin and coursing up through the uncut strip of skin. The large bunch of

veins on the upper and inner side of the calf was not obliterated, nor were the internal saphena and its tributaries blocked either upwards or downwards.

Second Operation, 8th April.

Multiple excisions of small portions and double ligature of veins. There were 5 incisions with a combined measurement of $13\frac{3}{4}$ inches, i.e. greater than the circumference of the leg below the knee, thus longer than a garter incision would have been. The incisions were as follows:-

(1) Through the main varicose mass in the calf	6 "
(2) At the upper and back part of the calf	$1\frac{1}{2}$ "
(3) At the lower and back part of the calf	$2\frac{1}{2}$ "
(4) Above the inner malleolus	$2\frac{1}{2}$ "
(5) Above the outer malleolus	$1\frac{1}{4}$ "
	<u>$13\frac{3}{4}$"</u>

9th April. In great pain and could not sleep last night, but pain gradually diminished and disappeared two days later.

16th April. First dressing on 9th day. Stitches removed, and all wounds doing well.

25th April. All wounds healed, but somewhat tender after walking.

30th April. Tenderness and swelling on inner side of leg between the 9" and 6" incisions of the first and second operations.

10th May. Swelling and tenderness at length beginning to decrease.

21st May. Marked improvement; but pads over prominent veins, with bandaging of the leg, still needed and continued till the end of the month.

30th May. At the upper and inner side of the calf, between the two incisions (vide note of 30th April) there still remains a bunch of varicose veins which are not obliterated and cause inconvenience. Another projecting nodule exists about the valve of a vein on the inner and lower third of the leg, between the 6" incision and the cut over the inner malleolus. Otherwise the condition of the leg appears quite satisfactory, there being no oedema or anaesthesia.

I proposed to do a third operation for these remaining veins; but the patient declined any further surgical interference, and took his discharge on the 2nd June, 3 months after the first operation.

My whole procedure was wrong in this case. The primary incision was too high up and incomplete. If made at all it should have been a complete circle, cut much lower down and right through the great varicose collection in the calf. It should also have been combined with ligature and division of the long saphena at the ankle and in the thigh. The second opera-

tion was also a mistake, it was merely a multiplication of the other. The first was a single incision dividing many veins, the second consisted of several incisions dividing many veins. Probably the most effectual way of dealing with this case would have been:-

- (1) A circular incision at the ankle.
- (2) Excision of the mass of veins in the calf, intercepting both saphenæ.
- (3) Ligature and division of the long saphena above the knee and in the groin.

Case XII.

Varix of both legs, no ulcers. Incomplete circular incision, followed a month later by garter operation on left leg. Case seen a year afterwards.

G. T., æt 41, British, printer, 10 years in India, was admitted into the contagious ward for erysipelas of the leg on the 16th January, 1896. After a probationary period in the observation ward, he was transferred to my surgical ward on the 8th February.

He was a sickly looking man, prematurely aged in appearance, the subject of malaria, alcoholism and gout. He had been under treatment in this hospital for ague for 6 weeks prior to his present admission, and had been in poor health during the interval. The irregular habits induced by alcoholism had cost him a good situation with a well-known firm of publishers. He stated that from childhood, as far back as he can remember, he has had varix of the left leg, especially

in the calf. This leg, particularly the ankle, has been swollen for several years, ever since he was injured at football.

Condition before operation. Pigmentation of both ankles and lower part of leg; but no trace of ulcers or eczema. Left ankle swollen and thicker than the right one. Well marked varix of the left leg; enlarged, knotted, tortuous veins over the left calf and shin, mostly converging to join the internal saphena about the level of the popliteal space. The veins of the foot and ankle also affected, but the worst were in the calf. Varix was less pronounced in the right leg.

First operation, 17th February, 1896.

The circular incision was made unusually high, crossing the popliteal space behind, but not completed in front, just below the lower border of the patella. Circumference of leg $13\frac{1}{2}$ inches, 11 inch incision, $2\frac{1}{2}$ inch of skin left uncut. Over 20 ligatures applied.

He complained of throbbing pain for the next two days, after which his leg was quite easy, and he had singularly little œdema or congestion of the limb while in bed.

24th February. First dressing on 8th day. Primary union except for an inch posteriorly.

18th March. Wound soundly healed. Sensation normal throughout the leg. A vein has become very prominent across the upper part of the tibia. Some conspicuous veins run vertically upwards, and there are knotted varices containing fluid blood on the inner side and back of the calf. There is some oedema of the foot and ankle.

Obliteration of the superficial system of veins has occurred only very partially, and the operation proved unsuccessful, probably because the incision was an incomplete circle and was too high up, and because he was not kept strictly confined to bed with a splint on.

Second Operation, 20th March.

A complete circle or garter made from 2 to 3 inches below the former incision. A few veins were found occluded by the previous operation; but the majority were pervious and gave rise to smart hæmorrhage when cut. They were much dilated, thickened and tortuous. A good many veins were tied in front, behind and to the inner side; but there was nothing to ligature on the outer aspect of the leg. The external cutaneous nerve in the back of the calf was thicker than usual, so its cut ends were sutured together.

Continuous deep and superficial sutures applied in three sections to close the wound.

30th March. First dressing on 11th day. Union by first intention, and the veins of the leg look much smaller.

8th April. An attack of gout in the left foot, chiefly affecting the great toe, and to a lesser degree the ankle, which continued for the rest of the month.

1st May. During the past week the wearing of a boot caused irritation of the gouty toe and swelling of the ankle. Walking produces swelling and hardness of the calf. A recrudescence of gout during the first three weeks in May.

23rd May. Calf softer, ankle less swollen; left ankle measures 11 inches as compared with $10\frac{3}{4}$ of the other, i.e. its measurement is probably less than before operation. Though the limb tends to swell a little on his walking about, yet this is easily controlled by a bandage or by elevating his foot.

2nd June. Scarcely any veins visible unless he walks a good deal, when a few small knots appear on the back of the calf and about the tendo Achillis, and the veins of the foot become turgid. Ankle inclined to swell after much walking or standing. Occasionally slight pain or tenderness in the band of skin between the

two incisions. He was discharged next day, $3\frac{1}{2}$ months after the first, and $2\frac{1}{2}$ months after the second operation.

The result was not so satisfactory as in the other garter cases, but it was a great improvement on the first incomplete circular operation. Probably the best way to deal with this case would have been to make two circular incisions above the ankle and below the knee, with careful bandaging and the use of a splint for quite a month afterwards.

February, 1897. A year after the first operation I saw him in the wards of a colleague. He had been admitted on the 24th January, 1897, for a neglected razor-cut on the left knee, inflicted a month before, which had suddenly become inflamed. During the two previous days the ankle and the lower part of the leg had become red, inflamed, and slightly swollen.

No prominent veins were visible anywhere on the leg, except about the ankle and the dorsum of the foot. Slight numbness remained on the outer and back part of the calf (peroneal cutaneous); but sensation was not delayed as to conduction, and was fairly acute. He felt distinctly the gentle touch of a finger, pencil or pin, anywhere on the leg.

He expressed himself satisfied with the result of

the second operation, and cured as regards the varix of the leg. He has been at work in the Imperial Paper Mills since July 1896, where he had to stand or walk all day. He found the veins did not become prominent after the day's labour.

I saw him only once or twice after his admission in 1897. It struck me that the red and inflamed condition of the leg was probably the result of a too festive observance of the New Year. On the 16th January, 1896, he was admitted with erysipelas of the left leg, and later developed gout. On the 24th January, 1897, he was again in hospital with a red and inflamed condition of the same leg. The similarity of dates and symptoms soon after the New Year may have been a coincidence; but when this occurs in a man of unsteady habits, who looked in poor health and had an unhealed cut on his leg a month old, then there is some ground for attributing the inflamed leg to alcoholism, and not to varix. Especially so, as he acknowledged that the varix had ceased to trouble him since June of the preceding year, therefore the result of the garter operation may be regarded as fairly satisfactory in this unhealthy subject.

Summary. Sixteen operations were performed on these 12 cases,—a dozen primary and four secondary. Of

the former 3 were double operations, i.e. on both legs; in one of the single operations there were incisions at the knee and ankle, in another at the groin, knee and ankle, and in one secondary case they were at the groin and knee. There were ulcers present in 6 of the cases. The right leg was affected in 4, the left in 1, and both in 7 cases. All the patients were males, varying in age from 20 to 63; 4 were between 20 and 30; 4 from 40 to 50; 3 from 50 to 60; and 1 was over 60. The age at which varix commenced was ascribed to infancy or childhood in 2 cases; in 2 to boyhood; 2 noted symptoms at 17; 1 at 19; 1 at 20; 1 at 22; 1 at 33; and in 2 cases no precise age was given, though they were both of old-standing.

Touching the question of etiology, in the majority there appeared to be an **inherent** tendency rather than any local cause. In Case III the varix came on after typhoid fever, and we know that thrombosis of the iliac, femoral, or some other deep vein, is occasionally a sequel of this disease.⁽²⁶⁾ In case VIII the cause would seem to have been traumatic, for the varix followed hard on the deformity of a badly-united fracture, the callus of which may have exerted obstructive pressure on the deep veins. In case V

(26)
cf. a case reported by Mr. Jonathan Hutchinson, B.M.J., 1888, p. 1212;
also H.W. Phillips' case, *Lancet*, 19-9-85, p. 521.

the origin of the varix in the left leg was attributed to a blow from a cricket ball; but as both legs were affected, and as the varix began in boyhood, this injury could have been at most only a subsidiary cause, - a local exciting cause which might prove the starting point for, or might aggravate, an inherent varicose tendency of the limb. In case IX, varix was said to have commenced at 33; but the marked prominence of the veins in the arms and trunk, the presence of dilated cutaneous venules, and the exaggerated varicosity of the veins in the lower extremities, all point to a condition of congenital over-development of the venous system. Case VI seems to have been one of either congenital excess or deficiency in the veins and their valves, as also cases V, X, and XII. The etiology of cases I, II, and XI may, in like manner, have been some hereditary or congenital structural defect, which became manifest in adolescence or early manhood instead of in childhood.

The nationality of 6 was British; 2 were Germans; 2 Swedes; 1 Dutch and 1 French. Out of the dozen 11 were sea-faring men, 7 being seaman, 1 a blacksmith and donkeyman, and 3 had secured less arduous employments on boardship as sailmaker, steward and cook. The single landsman was a printer.

The cases have been arranged in three series,

according as the operations were, - (1) Simple garter, 1-5; (2) Combined with some other measure above or below the garter, 6-9; (3) Incomplete circular incision, 10-12.

II. The Treatment of Varix and Varicose

Ulcers of the Leg.

(1) The Treatment of Varix.

Under each of these headings - varix and ulcers - treatment is either palliative or radical. Palliative treatment may be medicinal, mechanical or operative; but a radical cure can be effected in one way only, by a surgical operation. It is true that doubt has been expressed by the majority of surgeons regarding the efficacy or permanence of the so-called "radical cure" by any surgical procedure. I have now before me the letter of a well-known surgeon and teacher in which he acknowledges himself sceptical of the practical utility of some mechanical and all operative measures:- "I have never yet been much in love with operations upon dilated veins, regarding them as an indication of blocking to an equivalent extent of the deeper trunks. I have equally been inclined to distrust the use of bandages and elastic stockings," he says, and then proceeds to give his reasons for these conclusions.

Billroth⁽¹⁾ has denounced surgical interference

(1)
General Surgical Pathology and Therapeutics.

with varix as both useless and dangerous. He says we are helpless in the treatment of varices, because we cannot obviate the tendency to the disease: as we cannot even prevent the pressure which causes them and cannot reduce the veins to their normal calibre, we "must, therefore, come to the conclusion that for the most part they are incurable." As in many cases the formation of varices is a natural compensation for abnormal pressure in the vascular system, we must remove the cause before we can expect a cure. Removal of one or more varicose veins would be followed by other channels becoming affected. "On this account alone I would avoid all operations the object of which is to excise one or more varicose knots from the leg."⁽²⁾ Then he goes on to say that as individual varices per se cause little inconvenience and as all operations on veins may prove dangerous to life from thrombus or embolism, "you will agree with me when I declare the operation for varices utterly uncalled for."

Mr. Syme's⁽³⁾ opinion was much the same:- "But in the present state of information upon the subject, it seems that the most judicious course in treating varix is to be satisfied with remedying its bad conse-

(2)
Lectures on
Surgical Path-
ology and
Therapeutics.
Vol. II, p. 319.

(3)
Principles of
Surgery.

quences, and using means for preventing their occurrence." This view, expressed in the 2nd edition of his work in 1837, he repeated nearly 20 years later in the 4th edition. Mr. Spence,⁽⁴⁾ in giving modified approval to acupressure, said:—"It is not a true radical cure, except as regards the vein originally affected; and varix is a disease which we cannot expect to cure radically, for we cannot obliterate all the veins of the limb."

The reluctance among surgeons in the first half of the century, (more correctly, perhaps, from about 1805 to 1870) to operate on varix was merely the swing of the pendulum, or reaction from the reckless practices of the preceding century. In like manner, the pendulum has swung back during the past 30 years, thanks chiefly to the comparative immunity from risk obtained by Lister's methods, so that now the tendency is for undue meddlesomeness surgically with cases of varix which either do not require operation, or which are past all hope of benefit.

A brief survey of the history of operations for varix may prove not uninteresting. Up till about a century ago surgeons used to treat veins in a casual and cavalier fashion, operating on them freely and

(4)
Lectures on
Surgery,
Vol. I, p. 265.

fearlessly because the dangers of septic phlebitis and pyæmia were not recognised or understood. The almost universal practice of phlebotomy is an illustration of this statement. The operations now in vogue, or which have come into use during the last 30 years or so, were practised not only last century but many centuries ago. Billroth refers to the cutting or tearing out of varices by the early Greeks, and to the application of a hot iron to induce coagulation in veins. Mr. Travers⁽⁵⁾ points out that "the ancients treated the veins with singular rudeness - pricking, cutting, tying and burning them." He tells us that Hippocrates (about 460 B.C.) punctured varices; that excision of varices was described by Aëtius (of Amida in Mesopotamia, 6th Century A.D.) and Paulus (probably of Aegineta, belonging to the Alexandrian school, not the other of Merida, circa 530-560 A.D., is meant) and by writers of the Arabian school like Avicenna and Albucasis (Cordova, 961-1013 A.D.); also that excision was practised by Fallopius (of Modena, first half of 16th Century) and Severinus (Peder Soerensen, latter half of 16th Century).

Mr. Hodgson states in his famous work⁽⁶⁾ that:-
 "The ancients removed varices by excision, or destroy-

(5)
 Surgical
 Essays, Part I.
 P.210.

(6)
 Diseases of
 the Arteries
 & Veins,
 p.546.

ed them with burning irons. Celsus (Aurelius Cornelius Celsus, 1st Century A.D., during the reigns of Tiberius, Caligula, Claudius and Nero) employed both the actual cautery and excision." The latter Celsus preferred for tortuous and convoluted veins, whereas merely thickened and dilated veins he laid bare by incision, and then applied the actual cautery to different parts of the exposed vein. Mr. Fry⁽⁷⁾ notes that Celsus advocated complete excision, and Mr. Davies-Colley⁽⁸⁾ refers us to Celsus De Medicina, lib. vii, cap. 31, for this statement. He goes on to say that "the same plan was used by many British surgeons, but it fell into disuse on account of the diffuse inflammation and pyæmia" which sometimes occurred.

Puncture, ligature or incision of a varicose vein does not appear to have been considered sufficient in the 16th and 17th centuries, because stress was laid upon emptying the diseased veins of blood, and even extracting coagulum from them. Travers⁽⁹⁾ tells us that "Fabricius Aquapendens and Fabricius Hildanus (both 16th century) enclosed the varicose vein between two ligatures, and emptied it by incision. Ambrose Paré (middle of 16th century), Petit, Dionis and others emptied it by punctures and brought its sides

(7)
B.M.J.,
5/9/85.

(8)
Guy's Hospital
Reports,
Vol. XX, p. 432.

(9)
loc. cit., p. 210.

into contact by compression." Hodgson⁽¹⁰⁾ states that: "Another mode of effecting the radical cure of varices consists in cutting open the dilated vessel, removing the coagulum which it contains, and placing the opposite sides of the cavity in contact by means of compresses and bandages, which at the same time restrain the hæmorrhage. In this manner the adhesion of the opposite sides of the dilated vessel is effected, and its cavity is consequently obliterated. This practice, which with some modifications appears to have been employed by Fabricius ab Aquapendente, has been tried in this country." He notes that Paré and Dionis described division of varices between double ligatures. Dionis recommended long-continued compression after free bleeding and emptying of the vein by a lancet puncture. Both Paré and Petit used to puncture a vein high up, let it bleed freely, rub and express all clots from it, and then apply compress and bandage. In their hands this method is said to have been successful. Petit confined excision to cases of very localised varix; but Baron Boyer was in the habit of tying the veins and excising the varicose mass. At a later date, about Velpeau's time, Davat and Fricke used to practise transfixion of varicose veins, which Dunsmure⁽¹¹⁾ stigmatised as "very risky".

(10)
Op. cit., p. 547.

(11)
Probationary
Essay on Varix
p. 27.

Von Gräfe used to split open the vein and stuff the cavity with lint, so as to get healing by granulation from the bottom of the wound. Mr. Marshall⁽¹²⁾ notes that "this was, of course, an effectual cure, but it was a tedious one, and was not unfrequently complicated by suppurative phlebitis."

(12)
B. M. J., Vol. I,
1875, p. 104.

There was a curious notion that persons with varicose veins could stand loss of blood better than other people, or that more blood could be taken from varicose than from healthy veins, and that such subjects were not weakened even by the withdrawal of large quantities of blood.⁽¹³⁾ This idea seems to have been based on "experience", and on the supposition that the blood contained in varicose veins moves more slowly than the rest of the circulatory system. Both Petit and Boyer relied implicitly on this theory and acted accordingly. Hodgson and Dunsmure note that Petit used to remove 2 or 3 lbs. of blood from varices "without causing the least weakness." Petit also thought it most important to extract clots from varices, and he used to puncture or slit up veins in order to remove coagula. We are assured that:—"By removing this cause of obstruction, not only the increase of the disease was prevented, but the dilated vessels frequently diminished after the operation."⁽¹⁴⁾ This prin-

(13)
Dunsmure,
Op. cit., p. 12.

(14)
Hodgson,
Op. cit., p. 537.

ciple forms rather a contrast to that in which coagulation is sought for the obliteration and cure of varices. Although Petit drew strings of coagula out of the veins, yet he probably produced adhesive phlebitis and obliteration of the lumen of the vessel in those cases which escaped septic complications. Petit recommended phlebotomy and rest in bed for the cure of varicose ulcers.

Sir Everard Home described and practised the cure of varicose ulcers of the lower part of the leg by ligature of the long saphena at the knee. Of this method Mr. Syme⁽¹⁵⁾ said:—"The ligature, which had been long before tried and rejected on account of the danger attending its use, was recommended and on his (Sir E. Home's) authority tried rather extensively, but with such trouble and even fatal consequences, as effectually prevented it from being employed in future". Travers mentioned that he remembers ligature of the saphena major being frequently performed about 1801 for varicose ulcers of the leg.

Sir Benjamin Brodie revived the old practice of simple subcutaneous division of the vein through a small aperture in the skin, as in tenotomy, and his "apparent success" is noted by Sir William Fergusson⁽¹⁶⁾.

(15)
Op.cit., p.121

(16)
System of
Practical
Surgery,
5th ed., p.375.

But Syme⁽¹⁷⁾ remarked:- "The consequences of this practice, though not so disastrous as those of the ligature, were still disagreeable enough to overbalance the chance of benefit."

(18)
John Hunter drew attention to the evil results which might follow injury of, or surgical interference with veins; but the hint was neglected or lost sight of until it was taken up, amongst others, by Mr. Joseph Hodgson and Mr. Benjamin Travers. The former published his book on "The Diseases of Arteries and Veins" in 1815, and the latter's essay "On Wounds and Ligatures of Veins" was printed in 1818. They fully realised and earnestly attracted attention to the fatal results that might supervene on operative interference with veins, and the records of the cases they detail demonstrate clearly the untoward symptoms of sepsis, sapraemia, septicaemia, and pyaemia. Both Hodgson and Travers wrote impressive and startling reports of death following ligature, incision, or excision of the vena saphena major for varix or ulcer of the leg, as well as of fatal results after simple phlebotomy of the median basilic or cephalic veins. Prior to them surgeons used to speculate on unfortunate results being due to the irritation of a nerve, of muscle, tendon, or

(17)
loc.cit., p.121

(18)
Syme, op.cit,
p.119; also
Trans. of a
Soc. for the
Improvement of
Med. & Chir.
Knowledge,
Vol.I, p.16.

even fascia. All sorts of tissue were indiscriminately endowed with a fatal power of "irritability"; but to Hodgson and Travers, and some of their contemporaries, is due the merit of narrowing these speculations to their true issue by clinical observation, post-mortem dissections, and experiments on animals. One result of their labours proved a great boon, inasmuch as it helped to bring into disfavour the too ready use of the bleeding lancet. Another consequence of this reaction was to discourage all cutting operations on varices, to limit treatment to the mechanical means of compression or the use of caustics, and to bring about a policy of non-interference, such as that already quoted from the teaching of Billroth and Syme. This is all the more significant as emanating from such bold, experienced, and influential surgeons, masters of their art and leaders of the surgical science of their times.

Dunsmure⁽¹⁹⁾ states that Travers cured varices by artificial pressure applied as tight as was tolerable, by means of narrow strips of adhesive plaster round the leg; but Travers⁽²⁰⁾ himself gives the true explanation of "obliteration by inflammation", produced by applying the plaster "with as much strictness as

(19)
op.cit., p.22.

(20)
Op.cit., p.236.

could be borne." Hodgson⁽²¹⁾ recommends "powerful compression and adhesive straps for a circumscribed dilatation", and mentions two cases of localised varicosity obliterated by strapping. Case LI, a carpenter of 19, had a cluster of varices like a pigeon's egg on the saphena major in the calf, and a similar one in the middle of the thigh. Soap plaster was applied to the swellings and the whole limb bandaged. Circulation ceased in the vein; but the veins round the ankle and the saphena minor gradually became enlarged. He was ten months under observation.

Case LII was a woman of 40, with a large varix below the middle of the thigh and an irritable ulcer of the leg. The same treatment was adopted, and proved successful. Dunsmure alludes to another modification of the principle of compression which took the place of the knife and the ligature. This was a dreadful invention called Breschet's forceps, which resemble Dupuytren's clamp for the closure of artificial anus. The instrument was made to grasp and compress the skin as well as the vein for 24 to 36 hours. It is mentioned that "troublesome results were apt to follow".

Baron Dupuytren⁽²²⁾ used "to relieve the venous system" by bleeding from the arm, once or oftener, before

(21)
Op. cit.,
pp. 563 & 542.

(22)
On Lesions of
the Vascular
System,
pp. 95 & 98.

applying uniform compression to the lower limb and keeping the patient lying down. He states that a great variety of means had been used for the radical cure of varices, and that almost all had been abandoned in turn, leaving ligature and compression as the measures most usually resorted to. Regarding ligature, he asserts the success attending it is by no means uniform, and after quoting cases to show this, he goes on to say:- " I must candidly admit that frequent failures, and the attendant risks have induced me to relinquish this plan of treatment."

Dunsmure wrote his essay in praise of the method of compression by needle and ligature, which was introduced by Velpeau in 1829-30, and practised by him with great success. While the patient stood erect Velpeau raised the skin and subjacent vein between the left thumb and forefinger, and then pushed a pin or needle beneath the vein. After inserting the requisite number of needles - 2 to 8, ligatures were simply passed round the needles or twisted as for hare-lip. Coagulation commenced on the 2nd or 3rd day, the needles were retained for seven to ten days, and the cure was complete in two or three weeks. Davat modified Velpeau's operation by acupuncture as well as acupresure, he added a second needle at right angles to the

other. Thus one needle was thrust under the vein transversely to its axis, while the other transfixing the vein, passed behind it, and pierced it a second time before the point emerged. Threads were then twisted around each needle. The puncture of the vein by the second needle was done with the view of exciting greater inflammatory adhesion than was usually obtained by simple acupressure. Mr. Howse⁽²³⁾ incidentally mentions that he saw in Paris "gangrene of the whole leg from septic phlebitis in a man operated on for varicose veins by the ordinary pin operation."

Liston adopted Velpeau's procedure, as also did Sir W. Fergusson⁽²⁴⁾, who by his practice and teaching did much to resuscitate operations on veins. Erichsen⁽²⁵⁾

pronounced it "the most convenient and safest way of obliterating the vein." He passed several hare-lip pins under the vein, commencing from above downwards, and put pieces of wax bougie over them to protect the skin from undue pressure by the twisted sutures.

Mr. Henry Lee⁽²⁶⁾ improved on this method by subsequent subcutaneous division of the portion of vein occluded by coagulation. He passed a couple of needles an inch apart under the vein at various points, applied the figure-of-8 threads, and on the third day divided the vein subcutaneously between the needles.

(23)
Guy's Hospital
Reports,
Vol. XXII,
p. 455.

(24)
Op. cit.,
pp. 37 & 376.

(25)
Science & Art
of Surgery,
Vol. II, p. 64.

(26)
Lancet,
p. 351, 7/4/60.

Breaking off this incomplete and desultory account of the operative history of varix at the point just preceding the era of antiseptis, I shall now endeavour to review more systematically the various methods of treatment.

Medicinal Treatment of Varix.

Under the category of ~~the~~ palliative measures, medicinal treatment may be first considered. Such an expression may seem strange as applied to varix of the leg; but at one time varices, especially if associated with ulcers of the leg, were ascribed to a diseased condition of the blood, or to a peculiar diathesis. Mr. Skey ⁽²⁷⁾ considered varices indicated "the constitution of debility, a deficiency of power in the acting organs of the circulation." So it came about that attention was largely directed to diet, regimen, and the use of internal remedies. It may still, however, be regarded as the rule to aim at securing the regular and healthy action of all the excreting and secreting organs, as a preliminary to the treatment of varix of the lower limb. Under the impression that constipation is an etiological factor,

(27)
Lancet,
1864, p.1.

or that loaded intestines and colon may exercise adverse pressure on the iliac vessels, especially on the left side, it is customary to prescribe aperients or mild purgatives to the subject of varix who is of a costive habit. ⁽²⁸⁾ Bennett says:—"Cases in which relief of constipation is followed by a corresponding amount of comfort in the varicose limb are so common that it is unnecessary to narrate examples." In like manner amenorrhœa and dysmenorrhœa may be associated with varicose phenomena, so it is usual to prescribe emmenagogues or any necessary gynaecological treatment in such cases. Bennett reports two interesting examples illustrating the benefit to varix accruing from improved menstruation. Similarly gout and hepatic affections, etc., may require attention. More important, however, are conditions arising from embarrassed circulation, due to enfeebled cardiac action or pulmonary obstruction, for which the appropriate remedies must be prescribed.

Before passing to local medicinal agents, the opinion of one observer may be quoted as a touching instance of simple faith in the efficacy of internal remedies. Dr. J. H. Musser ⁽²⁹⁾ has put it on record that he has cured varices and varicose ulcers by the use of the fluid extract of Hamamelis Virginica admin-

(28)
Op.cit.,
pp. 49-52.

(29)
Med.Times,
21/4/83,
and
Ed. Med. J.,
p.473,1883.

istered in teaspoonful doses three or four times daily.

In conclusion, reference may be made to the local use of vesicants, escharotics, and coagulants for the purpose of setting up thrombosis and effecting obliteration of the affected veins. There is Dr. W. Taylor's⁽³⁰⁾ "restorative" treatment, which consists in blistering the skin over 6" of the vein daily from below upwards with Rubini's tincture, applying a coat of flexile collodion after the blistering fluid has dried, and later on the use of strapping. He also advises the patient to practise walking on tiptoe.

Mr. Hodgson mentions blistering the skin over varices as a method of treatment. Mr. Ure⁽³¹⁾ of St. Mary's Hospital, has been credited with the introduction of blisters for the cure of varix, the blisters being said to act best when the veins are unequally dilated and of varying thickness. His opinion was that "The blisters cure by causing contraction of the veins, and the deposition of fibrin into the surrounding areolar structures, and he has found the cure to be permanent, even in persons of advanced years." Dr. Rose⁽³²⁾

adopted the same treatment for varices and ulcers; but it was probably Mr. Syme⁽³³⁾ who initiated the use of blistering for the healing of callous and varicose

(30)
Ed. Med. J.,
p. 1127, 1891.

(31)
Lancet,
Vol. I, 1859,
p. 507, and
Vol. II, 1861,
p. 61.

(32)
Lancet,
16/6/64.

(33)
Princ. of Surg.,
P. 50, and
Contrib. to
the Path. and
Pract. of Surg
p. 42.

ulcers. Speaking of the callous ulcer, he said: -
 "I have accordingly found that the application of a large blister, covering the sore and a considerable part of the limb, greatly hastens the cure, and frequently proves sufficient for its completion, without the use of any other means." He found it "more speedy and lasting in its effects than the strapping process - and much more economical."

Escharotics.

Mr. Skey⁽³⁴⁾ objected to Velpeau's operation, and practised extensively the use of Vienna paste. At the beginning of 1864 he had treated 250 cases in 10 years. He made from 10 to 25 small eschars between the ankle and knee "on the most projecting surfaces of varicose veins." His escharotic paste consisted of:- Pure potash, $2/5$; powdered lime, $3/5$; and alcohol sufficient to make a paste. This substance was applied for 20 minutes, and he aimed at the influence of the escharotic extending through the vein. A cure was expected in a month's time. Mayo, Seutin, and Bonnet. were exponents of the caustic method, and Mr. Syme⁽³⁵⁾ ascribes it to Mr. Mayo, "viz. to make an eschar ^{with} ~~an~~ caustic over the vein at a sound part of its course above the varix, and thus excite such inflammation of the vessel as might be sufficient to occasion

(34)
 Lancet, Vol. I.
 1864, p. 1.

(35)
 Princ. of Surg.,
 p. 121.

obliteration of its cavity by the effusion of lymph." Mr. Stevens⁽³⁶⁾ followed the same treatment of varices in order to cure varicose ulcers. Potassa fusa sometimes burned its way into the veins and caused hæmorrhage, also secondary hæmorrhage and extensive suppuration were not unknown.

(36)
Lancet,
19/11/64.

Mr. Syme⁽³⁷⁾ made the suggestion that "The actual cautery may be found a safer means of curing varix," and Mr. Marshall⁽³⁸⁾ has remarked that:— "One old plan was to apply the actual cautery at intervals along the course of the vessel; but a mere burn of the skin was not sufficient for the purpose, it must go through the skin and into the vein; and this was a severe measure, often followed by diffuse phlebitis, and consequent blood poisoning."

(37)
loc. cit., p. 121

(38)
B. M. J.,
1875, p. 104.

Coagulants.

The injection of coagulants is referred to in many textbooks. Two methods were employed; in one the injection was circumvenous, in the other intravenous. The favourite fluid was the tincture or liquor ferri perchloridi; but carbolic acid had its advocates, as also had alcohol, chloral and ergot.

Dr. Lusk⁽³⁹⁾ mentions the subcutaneous injection of 1 or 2 grains of ergotine in solution. Dr. Englisch⁽⁴⁰⁾ of Vienna I think, injected 15 to 20 minims of a 50% aqueous solution of alcohol into the cellular tissue

(39)
Science & Art
of Midwifery,
p. 123.

(40)
Practitioner,
1878,
vol. XX, p. 370.

below the vein. This had to be repeated several times, and acted best with a bunch or plexus of varices; but inflammation and abscess occasionally followed. The injection of pure carbolic acid into the tissue about the vein is referred to in the Text-book of Surgery by American Authors ⁽⁴¹⁾.

(41)
Vol. I, p.216,
et seq.

When intravenous injection was performed, it was necessary to adopt the precautionary measure of compressing the veins above the site of injection for some time with a tourniquet or elastic band. Surgeon-
⁽⁴²⁾ Major W. F. Stevenson reported 8 cases in which he made one minim injections of carbolic acid into veins at intervals of an inch and a half, "as many as may be required." Cotton wool and collodion were applied over each puncture. But he confessed that "about 10% of the punctures caused suppuration, a little abscess about the size of a pea forming where this occurred." Again, "it sometimes happens that suppuration takes place at the seat of puncture two or three weeks after the patient has been discharged from hospital, and some of the resulting induration may continue tender on pressure for many months." Still he proceeds naively to remark, "these trifling drawbacks are amply compensated for by the simplicity and safety of its

(42)
Lancet, 1886,
Vol.II, p.769

performance, and the excellence of the results obtained from it." To Mr. Watson Cheyne⁽⁴³⁾ has been imputed the inception of this method, and Weber has reported on its success. Maylard⁽⁴⁴⁾ quotes Sir Joseph Lister as having injected pure carbolic acid into a large vein, "with a good result for 20 years." Pravaz, whose syringe is now so well known for anti-diphtheritic, anti-choleric, and anti-plague serum injections, was the originator of the perchloride of iron injection treatment. Erichsen⁽⁴⁵⁾ regarded it favourably, saying:—"This mode of injection is very effectual in large varix, and may in such cases be advantageously conjoined with the next method - the pins being used under the venous trunks, and the solution introduced into the dilated masses of the varix." At the same time he drew attention to the risks and dangers the procedure is liable to lead to. Mr. Durham⁽⁴⁶⁾ used to inject a neutral solution of persulphate of iron, and Broca used perchloride of iron.

(43)
Ed. Med. J.,
1888, p. 83.

(44)
Glasg. Med. J.,
1892, p. 182.

(45)
Op. cit.,
Vol. II, p. 64.

(46)
Guy's Hospital
Reports,
Vol. XXII, p. 455
et seq.

(47)
Lancet, 1874,
Vol. I, p. 791.

Hydropathy.

Another use of perchloride of iron was that lauded by Dr. Linon⁽⁴⁷⁾ of Verviers. He applied compresses soaked in a solution of perchloride of iron, and then bandaged the legs. Since dry bandages had not the same effect he ascribed all benefit to the

virtue of the drug. The notice concludes thus:—"The local action of thermal waters containing magnesia on the skin is similar to that of the perchloride. Thus at Luxeuil patients affected with varices derive great benefit from the Benedictine pond." Writing ten years later, Mr. J. H. H. Llewellyn⁽⁴⁸⁾ takes the editor of "The Lancet" to task for suggesting that excision is the only reliable cure for varix. Mr. Llewellyn pinned his faith to the external use of iron. His own words are:—"M. Simon (sic) of Verviers has used the perchloride of iron with great success. I can confirm this statement; for, ever since, now 10 years, I have employed the same with unfailing success in varicose veins of the legs."

(48)
Lancet, 1884,
Vol. II, p. 307.

Mechanical Treatment of Varix.

The next form of palliative treatment is the mechanical, this word being employed in a broad sense and not restricted to instrument-makers' appliances alone. Rest, recumbency, and elevation of the limb are important agents insisted on by every surgeon, particularly by Mr. Hilton⁽⁴⁹⁾. Conversely, anything inimical to them is contra-indicated, e.g. engorgement produced by long standing, monotonous and fatiguing

(49)
On Rest and
Pain,
p. 194, &
Lancet, 1855,
Vol. II, p. 54

exercise, or sudden and severe muscular strains.

At the same time, moderate and varied exercise, also massage in certain cases, are to be recommended.

Cold baths and douches, except in gouty cases, are

beneficial in incipient varix. Electricity has been

tried, "without any very positive good" in Mr. Bennett's (50) Op. cit., p. 58. (50)

experience. Any cause obstructing the venous flow must be removed or avoided, e.g. tight boots or garters.

Local Pressure.

The chief palliative measure is support by external pressure, which may be applied locally in a circumscribed area, or generally to the limb as a whole. The use of localised pressure is naturally

limited to a narrow range of cases, which can all

be more appropriately dealt with either by general pressure or by operation. Mr. Colles advised the

use of a truss to the upper end of the long saphena,

and Mr. Spence (51) gave qualified approval to a small

truss in the groin when the femoral and saphena are

both affected. But it is difficult to maintain any

appliance suitably on the thigh, and such contrivances

are objected to by both patients and surgeons on the

grounds of inconvenience and inefficiency, or as

being actively deleterious. Mr. Bennett (52) says,

"generally the effect is nil;" and Mr. Erichsen, (53)

(51)
Op. cit.,
Vol. I, p. 264.

(52)
Op. cit., p. 62.

(53)
Op. cit.,
Vol. II, p. 62.

"as a rule these modes of treatment only aggravate the symptoms."

Passing over wash-leather pads and bands, elastic anklets and knee-caps, inelastic supports for the leg and thigh; spring, hinged, and back-lever trusses; spiral clock-spring mechanisms, and many other expensive and ingenious inventions, I notice only the curious "Domen Varicose Circlet"⁽⁵⁴⁾ because of its alleged principle, which was claimed to be that of an artificial vein valve. "Its appearance resembles a garter, which is fitted with a curved steel watch-spring and contains a pad filled with glycerine." As a matter of fact, it acts like a spring truss, and is more apt to obstruct the venous circulation than to supply the place of incompetent valves in an over-distended vein.

(54)
Lancet, 1894,
Vol. II, p. 1396.

Practically, strapping with strips of stout adhesive plaster, judiciously applied, forms about the best and simplest means of exercising local pressure on the leg. Mr. Critchett & Mr. Chapman⁽⁵⁵⁾ used "Scott's strapping", which, in their hands, consisted of a dressing of lotio nigra on the ulcers, combined with compression by strips of plaster. M. Botto⁽⁵⁶⁾ of Genoa, applied direct compression so rigorously as to excite phlebitis and cause obliteration of the

(55)
Lancet,
22/9/55, p. 280.

(56)
Lancet,
7/4/60, p. 351.

vein. He occluded the internal saphena in a bad case of varices by compressing it, on a level with the knee and 5" higher up, with pledgets of lint and a bandage. Next day there was phlebitis between the two pads, clot formed, and in a couple of months "the vein was obliterated and transformed into a thick cord."

General
Pressure.

Uniform general pressure is much more easily and effectually applied to the leg than to the thigh.

On the latter about the only things which will remain in place, while exercising equable pressure, are "skin-tights" or "belt-drawers". Whereas the leg is better suited to the application and retention of pressure supports, of which a great variety has been contrived. There are stockings and leggings of many kinds, of silk, of elastic - either "woven" or "spiral", of leather or felt, and of combinations of these materials; they may be continuous, or interrupted by vertical slits for lacing, or they may be laced from top to bottom.

Bandages, however, are recognised as superior to any of these articles, simply because the pressure can be regulated at will so exactly. There is a great variety of materials for bandages; but the two best known and most suitable for the purpose of varices are the "stocking bandage," composed of

cotton-net or stockinette, and the rubber bandage of Martin. The first ^{*}notice of the latter which I have come across is an extract from the Canada Lancet (57) for the 1st June, 1878. In the British Medical Journal (58) for 1879 extracts are given of a correspondence between Dr. Martin of Boston and the editor concerning the former's invention. From this we learn that the material should be "best Para-rubber, 'cured' with a minimum of sulphur, calendered between steel rollers for smoothness." The general acceptance that Martin's bandage has met with amongst the profession and by the public, and the numerous references to its beneficial effects in medical literature, render it superfluous to dwell on this method. Perhaps, however, one little matter may be alluded to, which is the much greater comfort experienced by persons with delicate or irritable skins, or by people in the tropics, if they wear a cotton stocking under the rubber bandage.

Before leaving the subject of uniform general pressure, it may be noted that Billroth (59) preferred "continued compression" to any other treatment. This he applied as a laced stocking of leather split at the sides, or of rubber and silk tissue, or he used

**Trans. of the
American Med.
Assoc. for 1877.*
(57)
Practitioner,
1878, p. 379.
(58)
Vol. II,
pp. 417 & 479.

(59)
Gen. Surg.
Path. & Therap.

regular bandaging with cotton bandages, soaked in bookbinders' paste, which could be worn for 5 or 6 weeks consecutively.

Operative Treatment of Varix.

The operative treatment of varix may be palliative or radical. Many of the soi-disant "radical cures" are only palliative; what suffices for one case may prove utterly inadequate in another. Some surgeons consider any form of vein obliteration short of excision as not radical, and even excision may be followed by recrudescence in other channels if there be an inherent tendency to varix. This being so, I do not purpose to make any such arbitrary division of operations.

Just as the leading principle of mechanical treatment is pressure, to afford support or to procure obliterative inflammation, so likewise there are operative measures which exert either local and concentrated, or more generally diffused pressure.

Dr. Maclaren's stocking operation⁽⁶⁰⁾ is of the latter kind, whilst acupressure, the button suture, or the

(60)
vide p. 15.

Pressure
Operations.

Acupressure. vein brooch are examples of the former. Acupressure is the best known method of exerting localised pressure on veins. It was employed in two ways; either the needles were withdrawn at the end of the second or third day (e.g. Mr. Marshall), when sufficient inflammation had been excited to induce thrombosis, or the needles were left in situ for one or two weeks (e.g. Sir W. Fergusson) until they slowly divided the vessel by a process of pressure-necrosis and ulceration.

Dr. Dunsmure entitled his thesis "A Probationary Essay on Varix and its Treatment by Compression, as recommended by Velpeau." This compression was acupressure. Velpeau's common pin and thread were quickly improved on by substituting a needle, a hare-lip pin, or a broad needle like a seton; by using a figure-of-8 ligature in place of simply a circular one; and by protecting the skin from undue compression, by inserting a piece of rubber tubing between the skin and the thread. Sir William Fergusson⁽⁶¹⁾ taught that the pins, with the silk on them, should be left in position for a good while. "As a general rule, they should be left until they have excited considerable swelling and slight ulceration; and in

(61)
Syst. of Pract.
Surgery,
p. 377.

some instances, when the former is not very conspicuous, they may be permitted to separate by ulceration through both vein and skin. I recommend that the process of inflammation should be more implicitly relied upon than that of coagulation, either below a needle, or between a couple of them."

Acupressure was the method generally accepted for the radical cure of varices during many years. It was used by Liston, Lee, Curling⁽⁶²⁾, Erichsen, and many others. Nevertheless, it often failed to effect a cure. Mr. Spence⁽⁶³⁾, who allowed the needle to ulcerate its way through, since he found that withdrawal of the needle at the end of three days often left the vessel pervious, remarked:—"It is a radical cure of varix in the vein affected, but not of the varix of the limb." Mr. Pearce Gould⁽⁶⁴⁾, who favoured the insertion of two pins close together and division of the vein between them, stated that "acupressure often fails to obliterate the vein." Thirty years after Velpeau introduced acupressure for varices Sir James Simpson⁽⁶⁵⁾ published his works on the acupressure of arteries.

Button
Suture.

Dr. Nathan Bozeman of New Orleans published a pamphlet on the application of the button suture to

(62)
Lancet,
27/12/62.

(63)
Op.cit., p.265.

(64)
Treves' Syst.
of Surgery.

(65)
Acupressure,
a new method
of arresting
surgical hæm
orrhage. 1860.
Acupressure in
amputations,
1860.

Vein Brooch.

the treatment of varicose dilatations of veins, which
 is very briefly noticed in ⁽⁶⁶⁾The Lancet. At the Clinical
 Society of London Mr. J. R. A. Douglas ⁽⁶⁷⁾ read a paper
 on the cure of varix by his "vein brooch". This con-
 sisted of "a horn or steel spatula, with a grooved
 needle riveted at the eye and fastened at the point."
 The point of the needle was passed under the vein
 and then fixed in the catch of the brooch. Mr.
 Douglas claimed for his invention that "it gives very
 little pain, and, unlike the old torsion of wire or
 silk ligature, it obliterates the vein with certainty
 and without subcutaneous division." On the same
 occasion he showed an invention by Mr. A. Baird Douglas,
 which consisted of a flat-pointed steel pin and two
 india-rubber discs. The pin was passed through one
 disc, then under the affected vein, and lastly through
 the second disc.

(66)
19/1/61.

(67)
Lancet,
2/4/81.

Torsion

Torsion of veins has been practised for varices;
 but the twisted portion sometimes sloughed or led to
 suppuration. Under the heading of "Excision" Mr.
 Pearce Gould ⁽⁶⁸⁾ alludes to "Torsion of short lengths"
 as a modification. The method of torsion and avul-
 sion of short lengths of veins has been revived by a
 few surgeons. It is unlikely to be much used,

(68)
Op. cit.

because extensive extravasation, accompanied by acute pain, is apt to follow this operation. A variety of torsion, I suppose, was the principle of Vidal's enrroulement which Billroth⁽⁶⁹⁾ called "a subcutaneous rolling up".

(69)
Gen. Surg.
Path. & Ther.

Dissection.

In 1876 M. Rigaud⁽⁷⁰⁾ published the results of 140 cases treated by simple exposure to the air of the dissected varicose vein, a gum-elastic catheter being passed under the vein to raise it from its matrix. In some cases both the saphenæ were thus treated. It is stated that the vein was thrombosed on the 6th or 7th day, and that varicose ulcers healed rapidly. It is noted, however, that there were 3 deaths from pyæmia, following punctures in veins during dissection.

(70)
Practitioner,
Vol. XVII, p. 220,
& Bull. de la
Soc. de Chir.,
28/5/76.

Electrolysis.

Electrolysis in varicose veins is sometimes mentioned in an academic fashion as one of the methods for treating this complaint, but it is seldom used in actual practice. Following the example of Schuh, Mr. Duncan⁽⁷¹⁾ adopted it for a time, as also did Steinlein. When electrolysis is used the precaution must be taken to cut off the vein, or veins, from the general circulation for a time by exerting pressure above the site of operation.

(71)
Ed. Med. J.,
April 1886.

Ligature.

Veins may be ligatured subcutaneously or by

the "open" method. In order to diminish the length and weight of the column of blood which is an adverse factor when the valves fail, one or more ligatures may be put along the course of the main venous trunk whose tributaries are varicose. Two ligatures may be applied at a distance, as at the thigh and knee, or knee and ankle, in the case of the long saphena. This is done with a view to blocking channels, inducing stasis and coagulation, followed by exudation and organisation of plastic lymph and clot into tissue, obliteration and final atrophy. Ligatures may be applied in couples with less than an inch between the two; or, again, ligatures may be multiple, even very numerous on tortuous tributaries.

Subcutaneous Ligatures.

M. Ricord used subcutaneous ligatures, and Mr. John Duncan has been the chief exponent of the method in this country.* It is too well known to require description. There are certain undoubted disadvantages to the subcutaneous method. For one thing, a punctured wound has a greater surgical potentiality for evil than an incision. More serious is the fact that the surgeon has to act to some extent in the dark, he may puncture or slit the vein, he may not tie the right one, or not at the right place, or he may allow

*v. also W.H. Folker,
B.M.J., 18-8-33.

more deeply-seated diseased veins to escape unnoticed.

Mr. Davies-Colley⁽⁷²⁾ describes a case in which an irregularly dilated vein ($4\frac{1}{2}$ " x $2\frac{1}{2}$ " x $\frac{3}{4}$ ") "lay upon the internal saphena vein, which was not much, if at all larger than normal." Sir E. Home noticed that

"cases occur in which there is a small vein running parallel to the vena saphena. This, when the vena saphena has been taken up, afterwards becomes enlarged, and continues the disease."⁽⁷³⁾ But the chief objection to subcutaneous ligature is that the method of incision or dissection and ligature is far better, being quicker, safer, and more satisfactory. The exact condition of the veins can be seen, the process of ligature is far more rapid, there is no fear of puncture or injury of the veins since a blunt aneurism needle is substituted for the sharp-pointed hæmorrhoidal needle, and lastly, the wound can be washed out with an antiseptic lotion before closure. Mr. Duncan⁽⁷⁴⁾ does not seem to have found the method wholly satisfactory, because he wrote:—"Although free from risk, ligature is liable to that failure which attaches to all operations which involve merely section of the vessel." He next tried the application of two ligatures an inch apart; "but it is, I now know, not always absolutely reliable." Multiplication

"Open"
Ligature.

(72)
Guy's Hospit.
Reports,
Vol. XX, p. 432.

(73)
Hodgson on
Dis. of Art.
and Veins.

(74)
Ed. Med. J.,
April, 1886.

of ligatures gave him most satisfaction.

Multiple
Ligature.

Multiple ligatures may be very successful in obliterating a localised mass of varix, but the venous strain is frequently transferred to adjacent veins. In the Text-book of Surgery by American Authors, the use of 30 or 40 ligatures is ranked along with excision as the best radical method. Mr. Arbuthnot Lane⁽⁷⁵⁾ in advocating Trendelenburg's operation, says there is "very little use" in multiple ligatures.

(75)
The Clinical
Journal,
29/4/96.

"Main"
Ligatures.

The procedure of Dr. La Place⁽⁷⁶⁾ of Philadelphia, illustrates the plan of ligaturing the main vessel instead of the affected tributaries. He tied the long saphena at the saphenous opening, and the short saphena between the heads of the gastrocnemius. He operated under cocaine anaesthesia, and had 16 successes out of 17 cases, 6 being bilateral operations.

(76)
Philad. Med. &
Surg. Reporter,
8/7/93, &
N.Y. Med. Rec.,
8/7/93.

Trendelenburg's
Ligature and
Division.

As simple ligature was considered unreliable, double ligatures an inch or so apart, and division of the vein in the interspace, were resorted to. This procedure has been brought prominently forward by Prof. Trendelenburg of Bonn, W. Meyer and others^{*}, in the operation for ligature and division of the saphena major in the thigh. The site of this operation has been differently described as near the saphenous opening,

* M^r Pearce Gould's
record of 50 cases
was published in The
Lancet, 8th April, 1899,
p. 941, after this
was written & typed.

in the middle of the thigh, or at the junction of its middle and lower thirds. Trendelenburg's original site of ligature appears to have been over the sartorius, at the junction of the upper and middle third of the thigh. Dr. Moore⁽⁷⁷⁾ made his incision transverse, across the saphena near the saphenous opening. His aim was "to prevent the reflux of blood into the saphena vein and its branches, and he considered that the object was best attained by ligature above the junction of any branches of the lower extremity." Before operating by Trendelenburg's method "the surgeon must assure himself that the dilated trunk is the only one which carries the blood from the parts below, since very frequently there are two principal branches of the saphena,"⁽⁷⁸⁾ etc. Schwartz⁽⁷⁹⁾ ligatured and divided the internal saphena at two or three places.

The history of the ligature treatment of varix is a chequered one. It was greatly practised at one time, and has had various revivals. Its scope is rather limited. Ligatures of the veins leading to and from a varicose ulcer helps healing of the latter, obliteration of a venous cyst or dilatation can usually be effected by ligature, and the same may be said of a small knot or bunch of varices. But ligature, in

(77)
Intercol. Med.
J. of Austral-
asia, and
N. Y. Med. Rec.,
30/1/94.

(78)
Am. J. of Med. Sc.
July 1891, &
Braithwaite,
Vol. CIV, p. 52.

(79)
Braithwaite,
Vol. XCVIII, p. 27.

its general application to varices, is uncertain or inefficient. The lumen of a ligatured vein sometimes becomes restored. Mr. Duncan⁽⁸⁰⁾ notes that "a vein has a wonderful capacity for restoring its lost lumen." Disappointment often results after ligature from the development of varicosity of the neighbouring veins. Baron Dupuytren⁽⁸¹⁾ recognised that ligature of a main vein was unreliable. "Ligature of a trunk in which dilated branches terminate, with the view of procuring coagulation of the blood in the latter, and consequent obliteration of their canals, is far from attaining the desired end; for, experience proves that such obliteration does not extend beyond the immediate neighbourhood of the ligature." He ascribed any temporary benefit after ligature to rest and recumbency, and averred that varicosity recurred when the patient began walking again. He favoured as more certain in effect the application of two ligatures at distant points, e.g. ligature of the saphena at the malleolus and at the level of the condyle of the femur.

But the alarming and even fatal results which used frequently to follow the ligature of veins chiefly brought this method into discredit, and made it unpopular for so long. In pre-antiseptic days the silk,

(80)
Ed. Med. J.,
April 1886

(81)
On Lesions of
the Vascular
System,
Syd. Soc.

hemp, cotton, waxed whipcord, or metallic ligatures possessed obvious disadvantages and dangers, and the catgut, ox aorta, or tendon ligatures were even more disastrous before the introduction of carbolised, chromic, or silkworm gut. Even at the present day there is catgut ligature in the market which is not above suspicion, as we know to our cost in India, where much surgical and medical material that is unsaleable in Britain is foisted on us. With a view to diminishing risk and getting rid of the inconveniences of non-absorbable materials, temporary ligatures were tried by Jones, Travers, Hodgson, Astley Cooper, Velpeau, Scarpa and many others. But untoward results continued to recur owing to sepsis, or the obliteration of veins proved frequently only temporary.

Temporary
Ligature.

Division.

With the object of avoiding the dreaded ligature simple division of veins was practised long ago, and has been recently revived as if it was a new method. Just as ligature was objected to on the score of the veins becoming subsequently permeable, so the same objection has been brought against simple division of veins. Mr. Duncan⁽⁸²⁾ states that "division of veins subcutaneously is inefficient, the lumen is often reproduced." Mr. Spence⁽⁸³⁾ observes, "notwithstanding

(82)
B.M.J., 1881,
Vol. II, p. 37.

(83)
Op. cit., Vol. I,
p. 265.

that the vein was completely divided, the circulation was sometimes restored through it." The belief in the regenerative power of veins was at one time so great that it was asserted the lumen of a vein could be restored even after excision of a portion. This theory must have been the outcome of imperfect observations, which was only too probable when the operative methods in vogue were of a "subcutaneous" nature.

Von Lagenbeck and Velpeau appear to have believed in the regeneration of veins after the excision of small portions, and Minkewitsch⁽⁸⁴⁾ thought it worth while to confute them by experiments on dogs. He excised portions of the jugular or femoral veins, and proved that no regeneration had occurred three years afterwards.

(84)
Lancet,
16/4/70.

Division of veins may be performed subcutaneously or by open incision. It may be associated with ligature or excision of small portions, or the ligature may be dispensed with, reliance being placed on pad and pressure for the control of hæmorrhage.

Exclusion of the ligature is by no means new, as the subjoined extract from Hodgson's⁽⁸⁵⁾ book shows:—"It has generally been recommended that, during the operation, the veins should be tied both above and below

(85)
Op. cit., p. 547.

the varix before the latter is removed; but this point is not indispensable, for, in most situations, it will be possible to restrain the hæmorrhage by graduated compresses, adhesive straps, and bandages."

Nevertheless, Mr. Thornley Stoker published a paper in 1895 entitled "A New Method of Operating for the Cure of Varicose Veins", and the credit of a new departure was practically accorded to him in the Dublin⁽⁸⁶⁾ and American⁽⁸⁷⁾ Journals of the Medical Sciences, and in the Edinburgh Medical Journal,⁽⁸⁸⁾ i.e. 80 years after Hodgson's work was printed. Mr. Thornley Stoker observed that he had lost three patients from septicæmia, two of whom had been operated on for varix. As ligatures were attended with risk, and as they were unnecessary, he preferred to divide the veins at selected points through $\frac{1}{2}$ inch incisions, removing $\frac{1}{4}$ inch of the vein at each place. After irrigation, flat and sterile gauze compresses were applied. He warned surgeons against the use of thick compresses and tight bandages, which impeded capillary circulation and delayed repair. Very slight pressure was required to overcome the low tension of the blood in the veins.

Mr. Barker⁽⁸⁹⁾ recommends the same method, its chief merits being that no foreign body is left in the

(86)
March, 1895.

(87)
Vol. CX, p. 711.

(88)
June, 1895.

(89)
Clin. Journ.,
16/6/97.

wound in the shape of ligatures and sutures, much time is saved, and the results are excellent. He differed from Mr. Stoker in making two-inch incisions, and in applying Spencer Wells' forceps. It is strange that both these surgeons, in spite of their striving after rigid asepsis, should mention the application of a sponge - that fertile vehicle of sepsis - to the cut ends of veins.

Mr. C. B. Ball⁽⁹⁰⁾ also abolished ligatures in operating on varicocele, naevus, and varicose veins of the leg; but he retained sutures for the arrest or prevention of bleeding after forcipressure had been removed. "A series of deep silk sutures are passed under the wound, the one at each angle passing under the vein. These two sutures are first closed, as they completely control the bleeding, the portions of the vein to which the catch forceps are attached may be snipped away close up to the sutures." The deep sutures were removed about the 5th day.

(90)
Practitioner,
1895, p. 497,
Vol. LIV.

Incision
at Saphenous
Opening.

Before passing on to excision of veins allusion may be made to another form of incision, I mean the division of the falciform edge of the fascia lata at the saphenous opening⁽⁹¹⁾ Narrowing of the saphenous opening has been adduced as a possible cause of varix

of the long saphenous vein.

(91)
Spence's
Surgery,
Vol. I, p. 264;
Howse, Guy's
Hospit. Rep.,
Vol. XXII, p. 455

of the long saphena, and Mr. Herapath⁽⁹²⁾ amongst others, used to enlarge the opening to relieve constriction. The operation was never much practised and it soon fell into disuse, because it was based on a theory not confirmed by pathological facts, and since it rarely, if ever, produced any material benefit.

(92)
Marshall, B. M. J.
23/1/75.

Excision.

Excision is the most thorough means of dealing with a localised mass of varices, a single varicose vein, or a cyst-like dilatation, because the offending tissue is thus removed once for all. But the objection to other operations also holds good for excision, viz. that obliteration or removal of one vein may simply lead to varicosity of another. Excision cannot be carried out to its logical conclusion when the veins of one or both lower extremities are affected generally, because this would involve total extirpation of all the superficial veins from the foot to the groin, and would maim the limb from the extent of the incisions. It thus becomes a question how far, if at all, excision is superior to the other operative procedures for obliteration of veins in cases of general varix of the leg. On the whole, however, the balance of experience and authority inclines to the view that excision is the most satisfactory of the "radical

cures". Mr. Pearce Gould⁽⁹³⁾ states that, "excision⁽⁹⁴⁾ gives the best results and is most used;" Mr. Duncan remarks that, "excision is the only certain method;" and Mr. Jonathan Hutchinson⁽⁹⁵⁾ asserts that, "excision of long portions of dilated veins is the simplest and best operation."⁽⁹⁶⁾ Mr. Bennett is "fully convinced that the excision of considerable portions of individual veins is, in the great majority of cases, the best treatment. . . . It is absolutely essential, excepting in small local congenital masses, that a large portion of the saphena vein at the knee or in the thigh should be removed."

After such weighty opinions, so clearly expressed, it is needless to quote more.

Excision is usually combined with ligature, though some prefer to dispense with it and trust to torsion or pressure. Formerly, when ligatures were feared, acupressure was used to check bleeding after excision. Excision may be associated with other forms of operation, e.g. the garter incision.

Although the operation of excision of veins was practised long before the Christian era, and by numerous surgeons during the past 13 centuries, yet we find Mr. Maylard⁽⁹⁷⁾ asserting that:- "Excision was

(93)
Treves' Syst.
of Surg.,
Vol. I, p. 570.

(94)
Ed. Med. J.,
April, 1886,
p. 905.

(95)
Archives of
Surgery,
Vol. III, p. 371.

(96)
Clin. Journ.,
19/1/98, p. 197.

(97)
Glasg. Med. J.,
March 1892.

introduced by Mr. John Marshall in 1875; but it fell into disrepute from disregard to precautions." The title of the article in the British Medical Journal describing Mr. Marshall's procedure is, "A New Method of Treating Bad Cases of Varicose Veins of the Leg." It is striking to find Mr. Marshall, who advocated the most successful and most thorough of all radical operations, saying:—"All operations were, of course, only palliative, they merely shifted the disease from one locality to another." But this was simply the current dictum which had been long accepted by surgeons, impressed by the record of operative disasters as well as influenced by want of success. We find the same idea expressed in most books during three-fourths of this century. Professor Spence⁽⁹⁹⁾ lays it down that, "Varix is a disease which we cannot expect to cure radically, for we cannot obliterate all the veins of the limb."

That radical cure is a hopeless delusion, and that all operations for varix are most dangerous, are common opinions that have long been held by the public.

Mr. Howse⁽¹⁰⁰⁾ relates his experience thus:—"So deeply rooted, however, is the popular belief that there is no surgical cure for varicose veins of the leg, that,

(99)
Op.cit., p.265.

(100)
Guy's Hospit.
Reports,
1877.

though I have seen many suitable cases for operation, ...it was long before I was able to persuade a second patient with varices in the leg, to undergo the operation." This was in 1877, and Mr. Bennett⁽¹⁰¹⁾ gives a remarkable instance which occurred five years later. "The apprehension universally felt on this account, even quite recently, is sufficiently attested by the fact that I was consulted only a few weeks since, by a strong and healthy gentleman, upon whom I have since operated with the usual success, who was, as late as 1882, most strongly advised, by two of the first opinions in London, on no account to allow some varicose veins from which he suffered, to be excised, because the chance of 'blood-poisoning' after the operation would be so great."

(101)
Op.cit., p.76

Because many operations for varix have proved unsuccessful, and because there is a certain type of case in which all the veins of the body, or of the limb, are varicose or tend to become so, it does not necessarily follow that all radical operations are per se futile, i.e. that they are a contradiction in terms because varicose veins are as ineradicable as original sin. We might just as reasonably desist from the radical cure of hernia, because many relapses

occur, or because there may be inherent weakness of the abdominal parietes from congenital defects at one or more points. It seems to me merely an indication for the exercise of greater care in selection, and for more accurate differential diagnosis. If the varicose condition is so far advanced that the deep veins are hopelessly embarrassed, or if the disease chiefly affects the deep veins, then extirpation of superficial veins will tend to aggravate matters, just as would any oblitative measures. But all cases of varix are not universal or congenital, some are purely local, and never become general if adequately dealt with and at the proper time. In some cases the cause may be a local injury, or some local morbid condition; at some period only one vein or one set of veins, superficial or deep, may be affected. Localised cases may occur even in the congenital variety, for all congenital cases may not tend to overgrowth of the venous system, some are cases of congenital defect, in which the absence of some particular valve or valves is not wholly compensated for by the others. In all these instances, and in many others, we may reasonably attempt and expect a really radical cure.

Excision may be performed in different ways,

according to the nature of the case, the object aimed at, or the views of the individual surgeon. Excision may be single or multiple, and the single may be short or long, whereas multiple excisions are usually short and differ only in degree from multiple division or ligature of varices. Mr. Marshall's first excision of a considerable length of vein seems to have been done on the spur of the moment. He had slit up 9" of a varicose vein in the calf, after first inserting hare-lip pins at its upper and lower ends. "But, when I had thus laid open the vessel, it struck me that the healing of the wound would probably be accelerated if I removed entirely this ragged looking piece of useless membrane. . . . In performing it another time, I should, after exposing the vein, cut it through and remove it at once without opening it."

Long
Excision.

On the 7th November, 1874, i.e. $2\frac{1}{2}$ months before the publication of Mr. Marshall's case, Prof. Annandale⁽¹⁰³⁾ excised 3" of the spermatic vein for varicocoele. Four and a half years later Professor Annandale reported a case⁽¹⁰⁴⁾ in which he removed and obliterated 19" of a vein. He excised 10" of a vein running up the front of the leg from the outer

(102)
B.M.J., 1875,
Vol.I, p.104.

(103)
B.M.J., 1875,
Vol.I, p.139.

(104)
B.M.J., 1879,
Vol.I., p.935.

malleolus, 3" of the vein crossing the tibia obliquely were left, and then he excised 6" more as far up as the inner tibial tuberosity.

M. Remy⁽¹⁰⁵⁾ has published the results of 73 cases of excision of varices. There was one fatal case of septicaemia. "All dilated veins of the leg or thigh which can be seen or felt are excised, the saphenous being resected as far as Scarpa's triangle, if necessary. As much as 25" of varicose vein may need excision." M. Remy had seen 19 of his cases at least 2 years after operation. "11 remain completely cured, 4 are very much relieved, and 4 classed as failures or relapses. All the cures have, since operation, been engaged in more or less arduous occupations; and some have been accepted for military service." It is also noted that Madelung recorded 14 successes out of 52 excision cases, while Trendelenburg got 13 good results in 63 cases treated by multiple ligatures. Dr. Kendal Franks⁽¹⁰⁶⁾ observed that cure after excision has lasted one, two, or more years.

Dr. John O'Connor⁽¹⁰⁷⁾ is very emphatic in recording his preference for extensive excision of veins. After ten years operative experience, "I have come to the conclusion that nothing short of total extirpa-

(105)
The Medical
Chronicle,
May 1897, p. 124,
p. 124, and
Bull. Gén. de
Thérapeut.
30/3/97.

(106)
Dub. J. of Med.
Science,
May 1886, p. 417

(107)
Annals of
Surgery,
April 1897,
p. 526.

tion of the diseased portion of the vein merits the term radical." He does not consider 40 ligatures, or excision in a dozen places, sufficient to produce obliteration, he will have nothing short of removal of the offending portion of the vein in its entirety. His incisions varied from 10" to 20", and he mentions one case in which he excised 26" of the internal saphena.

Multiple
Excision.

Although total or extensive extirpation of a vein is more effectual, yet multiple excision of short pieces has been more practised. This is partly owing to its appearing less formidable, and because short excisions are frequently mere adjuncts to acupressure, ligature or division. ⁽¹⁰⁸⁾ Mr. John Bell used this method with unfortunate results, owing to extensive inflammation or hæmorrhage. The week after Mr. Marshall's case was published, ⁽¹⁰⁹⁾ Mr. Charles Steele, of Bristol, recorded his plan of torsion and excision of short lengths of vein. "The method I now adopt in an ordinary case is to isolate the main vein or veins below the knee, compress above to define the vessel, make an incision at right angles to its axis, dissect out the vein without pricking it, seize firmly with torsion-forceps, and drag out as much as possible, which seldom amounts to an inch, and cut off the piece

(108)
B. M. J.,
23/1/75.

(109)
B. M. J.,
30/1/75.

as close to the skin as possible at both ends. I pass a probe through the removed piece, to be sure that the entire calibre is secured. The vein in the leg is emptied of blood by pressure; if it do not refill, I am satisfied; if it do, I remove portions which are prominent below." Attention may be drawn to the fact that erysipelas, fortunately not severe, followed both Mr. Marshall's and Mr. Steele's first excision operations.

Mr. Davies-Colley⁽¹¹⁰⁾ reported one case in which he dissected out a convoluted mass $4\frac{1}{2}" \times 2\frac{1}{2}"$, consisting of a single irregularly dilated vein, and another case in which he excised a cyst-like dilatation $2" \times 1\frac{1}{4}"$ from the inner side of the popliteal space. Two years later Mr. Howse⁽¹¹¹⁾ published a series of ten cases of very short excisions for varix of the leg or varicocele. Dr. Farrant Fry⁽¹¹²⁾ favoured "Excision through several small incisions (not more than an inch in length) in preference to removing one large piece, as by so doing the vein is occluded at several points."

(110)
Guy's Hosp.
Reports,
1875, p.432.

(111)
Guy's Hosp.
Reports,
1877, p.455 .

(112)
B.M.J., 1885,
Vol.II, p.445.

(2) The Treatment of Varicose Ulcers.

A vast amount has been written on this subject, much misdirected energy and ingenuity have been expended, but mostly to no purpose, for the simple reason that the cardinal principles underlying treatment have been ignored; or, sometimes they have been compromised in the endeavour to obtain an "ambulant" cure, without interference with the patient's daily avocation. Mr. Gay,⁽¹¹³⁾ while striving to disprove the very existence of varicose ulcers, calls varicosities and ulcers of the lower limbs "the Castor and Pollux of Surgery." But the simile is more amusing than accurate, because they were the great twin brethren, whereas the ulcer follows varix, and is associated with it as a late symptom, the relation being rather parental and filial - that of cause and effect. To lavish attention on a herpes labialis, whilst ignoring the lobar pneumonia of which it is the outcome, would be considered an instance of malpraxis or misguided zeal; but to treat the ulcer and ignore the varix has been more the rule than the exception. As Mr. Steele⁽¹¹⁴⁾ truly remarks: - "It is but waste of time to treat varicose ulcers without destroying the varicose veins on which they depend, as they are sure soon to break down again.

(113)
Lancet, 1868,
Vol. II, p. 460.

(114)
Loc. cit.

Varicose ulcers whose veins have been destroyed immediately assume a healthy aspect, and heal much more readily from being relieved of chronic congestion."

The rapidity with which obstinate ulcers heal after most operations on varices is simply marvellous.

Elevation, rest, cleanliness and support are then the only simple measures necessary. Scraping, skin-grafting, strapping, blisters, plasters, unguents, drugs and dressings of all sorts can be dispensed with. Nor is it even requisite to wait till the ulcer assumes a healthy, healing appearance before operating with all due precautions, because the operation will soon convert the ulcer into the desired condition.

The cumbrous, cut and dry classifications of ulcers, and their eccentric nomenclature, have been another stumbling block in the path of rational treatment of varicose ulcers. Because they are difficult to heal, and have certain external resemblances to forms of quite a different origin, they are frequently called chronic^{**}, callous, or indolent ulcers, and are regarded merely as such. But the varicose ulcer may assume quite different characters, it may resemble the inflammatory ulcer, or the painful, irritable ulcer, and also other types. Still it remains varicose throughout, whether its condition happens to be callous,

irritable or inflammatory. By all means modify and allay these symptoms, but do not seek to effect an enduring cure by such temporary and palliative measures.

Operative Treatment for Varicose Ulcers.

Operation on the varices, then, should be the basis of treating varicose ulcers. Dr. R. W. Irving⁽¹¹⁵⁾ gives a good illustration of the healing effects induced by ligature of the largest "feeding-veins" connected with the ulcers, as well as ligation of the main vein at the knee. "The legs were bogged; ulcers unhealed and unhealable, typical, large, dirty and deep; with india-rubbery edges, hopeless; situated low down on the fibular side of the legs." Rapid improvement of both the legs and the ulcers followed operation, after "astringents, rest, boric dressings, bandaging, blistering, and actual cautery to the edges" had failed or made matters worse.

Mr. Hilton⁽¹¹⁶⁾ after drawing attention to the close association of the long saphena nerve and vein in the leg, showed the great advantage to be derived from dividing the offending terminations of any nerve

(115)
Ed. Med. J.,
Sept. 1896.

(116)
On Rest & Pain,
pp. 134 & 194.

in painful, irritable ulcer. He inserted a sharp, narrow bistouri a little above the tender spot, and then passed it under and through the granulations, severing the morbidly sensitive filaments. The result, in a case he quoted, was immediate relief and healing of the ulcer in a fortnight. C.W. Hamilton⁽¹¹⁷⁾ has written on the efficacy of local depletion in treating varicose ulcers. Mr. Cock⁽¹¹⁸⁾ of Guy's Hospital, and many others used carefully to pare or dissect out the hard, raised edges of a varicose or indolent ulcer.

(117)
Med. Press
& Circ.,
Vol. 68, p. 352.

(118)
Lancet,
22/9/55.

Harbordt and F. Spaeth⁽¹¹⁹⁾ practised multiple incision, or scarification, of varicose and other chronic ulcers. The objects aimed at were to start healthy granulations, to curtail the duration of the healing process, and to improve the quality of the cicatrix, thus diminishing the tendency to relapse. Dr. Spaeth maintained the scar was far stronger and more resistant than that which results from the natural closure of a varicose ulcer. "The entire ulcer is divided lengthwise by a deep incision far into the healthy tissue. Cross incisions are then made through callous tissue into the healthy at intervals of $\frac{3}{4}$ of an inch. The incisions must go not only

(119)
Practitioner,
1883, p. 332,
Vol. XL.

through the skin, but through the underlying fascia also, and the wounds must gape widely." It is acknowledged that the bleeding is often profuse, and that the wound has rather a "slaughter-house" look.

Dr. Whitla⁽¹²⁰⁾ describes a similar plan of alternately deep and shallow linear incisions, extending outwards from the centre like the spokes of a wheel. The deep incisions divide the deep fascia and extend an inch or two beyond the margins of the ulcer. The idea of producing a larger and deeper ulcer in order to obtain more cicatricial tissue and a firmer scar is not likely to gain much acceptance with surgeons, more especially since a much slighter cutting operation on the causal varices will do far more good.

Mr. Gay⁽¹²¹⁾ made curved incisions about $\frac{1}{2}$ inch from the edges of the ulcer, freely dividing any varices surrounding it. Acupressure, or ligature, was employed for the cut veins. "I know but one mode of producing permanent cicatrisation - by those incisions at the edges - by which the veins are freely divided, as well as any dense tissues which, by maintaining a state of morbid tension, counteract the healing tendency."⁽¹²²⁾

Traction sutures⁽¹²³⁾ have been used for the

(120)
Dict. of
Treatment,
p. 942.

(121)
Lancet,
31/7/69.

(122)
Lancet,
1868, p. 495.

(123)
Practitioner,
Vol. 22, p. 459.

closure of varicose ulcers. The skin of the edges is dissected up to form flaps, which are drawn into apposition over the surface of the ulcer, and retained in this position for 40-50 hours by straight needles, or some form of suture is used. Dr. Penny,⁽¹²⁴⁾ of Galveston, applied traction to the margin of the ulcer by means of strips of strapping plaster, with holes punched in them for the passage of a cord to lace the strips together. He preferred a rubber cord to a non-elastic one.

(124)
Practitioner,
1883, p. 52,
Vol. XXXI.

Skin-
grafting.

Skin-grafting is often resorted to for the healing of a varicose ulcer, the methods of Reverdin, Thiersch of Leipzig, or Wolfe, being used according to circumstances. Dr. J. A. Francis⁽¹²⁵⁾ recommended the use of sponge-grafts, — smooth, thin sections of a new, finely-textured sponge.

(125)
Practitioner,
1885, p. 67.

Mechanical Treatment of Varicose Ulcers.

As with varices, so with ulcers, some form of pressure is the basis of mechanical treatment. This may take the form of massage to the leg, to the edges and surroundings of the ulcer, and even to its surface. Maylard⁽¹²⁶⁾, Bekarewitsch⁽¹²⁷⁾ and others have recommended massage, and Kirsch⁽¹²⁸⁾ used a "specially constructed roller" for the purpose.

(126)
loc. cit.

(127)
Clin. J.,
7/10/96.

(128)
Braithwaite,
Vol. 109, p. 117

Whately & Baynton are accredited with "the merit of fully establishing the advantage of pressure" (129) Whately used a bandage of calico or flannel, and it is more than a century since Baynton of Bristol introduced adhesive strapping for ulcers (130) . Martin's rubber bandage forms one of the most convenient methods of applying pressure to chronic varicose ulcers, and its use has been eulogised by many writers, e.g. Mr. Callender, (131) and Mr. McGill (132) asserts that he has obtained 18 cures out of 20 cases by this means, a degree of success seldom attained by others.

(129)
Syme, Op.cit.,
p.49.

(130)
N.Y. Med.Rec.,
31/12/92.

(131)
Lancet,
12/10/78.

(132)
Practitioner,
Vol.22, p.358

"Ambulant" treatment is one of the objects aimed at in most forms of bandage treatment, so that the patient may continue to earn his living and get exercise out-of-doors. Dr. Bremner (133) used "a perfectly flexible, porous and absorbent bandage, which consisted of Gamgee tissue or absorbent lint, oiled silk or gutta-percha, and stockinette cotton bandage." He states that five weeks was the average duration of this treatment in 100 cases, that 80% were permanent cures, and that pain was relieved and swelling removed in the remainder. Truly remarkable results for any method in which neither rest in bed nor operation was resorted to, the only adjuncts being

(133)
N.Y. Med.Rec.,
9/4/92.

unguents and lotions. Kirsch⁽¹³⁴⁾ used sponge compression. A large sponge, flat on the under surface, was placed moist on the ulcer, and a bandage applied. The sponge was allowed to imbed itself in the granulations. An ointment was used later, but the sponge compression was persevered with even after the ulcer healed.

To augment the effect of bandages various smooth, hard, non-absorbent substances have been pressed on the ulcers themselves. Dr. F. P. Atkinson⁽¹³⁵⁾ mentions the use of sheet lead, moulded to the shape and size of the ulcer, just overlapping its edges. Mr. F. F. Flynn,⁽¹³⁶⁾ surgeon of H.M.S. "Asia", corroborates Mr. Atkinson, and says he has also seen plates of copper used for the same purpose. He mentions a native practitioner in Africa who employed the lead-foil lining of tea-chests to the surface of indolent ulcers, with benefit to the patients and much profit to himself. Dr. Moras, of Philadelphia, Dr. Elizabeth Reifsnyder⁽¹³⁷⁾ at Shanghai, and Dr. Watson⁽¹³⁸⁾ of Boston, praise the tin-plate treatment, sheet tin being cut to the size of the ulcer and applied over "protective", or other dressing, by strapping or bandage. Now that aluminium is coming so much to the fore in surgery, some one may possibly start a "novel" treatment similar to lead, copper and tin.

(134)
Braithwaite,
Vol. 109, p. 117.

(135)
Lancet, 1865,
Vol. II, p. 529,
and
Practitioner,
Vol. 22, p. 360.

(136)
Lancet,
1865, Vol. II.

(137)
N. Y. Med. Rec.,
7-11-91.
(138)
Whitla's Dict.
of Tr., p. 942

Medicinal Treatment of Varicose Ulcers.

It is doubtful if a review of even a small part of the literature on this subject will repay perusal. It is an illustration of the varied and diverse drugs that are used and "puffed" when treatment degenerates into opportunism and empiricism,-to the mere treating of symptoms and transient states. Of course, due allowance should be made for the fact that our large hospitals, particularly the teaching institutions, cannot spare beds for the accommodation of cases of chronic varicose ulcers treated solely by mechanical or medicinal means, nor can the poor afford the time and loss of money that lying up involves. Hence it comes that, although all surgeons recognise the advisability of rest and elevation of the limb as of the first importance to all modes of treatment, yet most of them treat cases of varicose ulcers as out-patients, combining pressure with a multitude of medicinal agents. Nevertheless, I venture to think that lying up for a month or two, to undergo some form of radical operation, would prove in the long run, an economy to the poor man's purse - as regards druggist's and doctor's bills, and to his time - as to long waits at hospital or dispensary. It would save him much of the trouble and inconvenience involved by most external

methods, e.g. washing and drying the leg four times in the day before each application of an ointment containing zinc oxide 15, vaseline 40, lanoline 100, not forgetting the bandaging. (139)

(139)
Clin. Journ.,
30/11/92.

The remedy and its mode of application naturally vary with the condition of things according as the ulcer is sloughy, foul, callous, feeble, inflamed, painful, exuberant, eczematous, &c. Some favour moist treatment, others affect dry methods, so powders, plasters, caustics, lotions - stimulant or soothing, ointments, mulls, jellies and other resources of the apothecary's armamentarium are brought into requisition.

Over thirty years ago, (1868) The Lancet⁽¹⁴⁰⁾ published a résumé of the treatment for ulcers of the leg in vogue at the out-patient departments of the most important London hospitals, which is of interest as affording us a glimpse of the methods and opinions of surgeons like Messrs. T. Smith, Bryant, Wood, Heath, Norton & Gay. Soap plaster strapping, or bandaging were used by all except the last, and opium was freely administered in the form of opium and soap pill, when the ulcers were of the irritable and painful type. Wet bandages, lotions of acetate of lead and glycerine, nitrate of silver 2 grs. to the oz., and ointments of

(140)
11/1/68.

of calamine, zinc, or resin, were chiefly used. Some 13 years earlier⁽¹⁴¹⁾ (1855) there is another summary of the treatment used for the in-patients of various hospitals. Mr. Skey emphasised the value of opium in assisting to reduce the irritation of the system, which may prevent ulcers healing. Messrs. Hilton, Critchett, and Adams trusted much to rest and elevation of the limb. Messrs. Critchett and Chapman pushed the use of Scott's strapping. Mr. Syme's deobstruent treatment of blistering in cases of brawny and oedematous legs, with callous ulcers, became very popular. Both he and Mr. Spence⁽¹⁴²⁾ recommended the use of "Black Wash" for varicose ulcers, indeed, the latter says "It seems to possess an almost specific action." Lotions of chlorinated soda, chlorate of potash or zinc chloride were alternated with black wash at times, and Dr. E. Diver⁽¹⁴³⁾ used wool saturated with chlorine gas, prepared by pouring hydrochloric acid 3i over chlorate of potash 3ii in a pickle jar. M. Boutier advocated chlorine water and skin-grafting. Now-a-days the "red" and "blue" sulphate of zinc and copper, boric, or weak bi-chloride of mercury, and carbolic acid lotions seem to have largely displaced the nitrate of silver, black wash, weak nitric acid and other older

(141)
22/9/55,
The Lancet.

(142)
Op. cit., p. 57.

(143)
N.Y. Med. Rec.,
30/6/94.

lotions. Though the use of solid nitrate of silver, or sulphate of copper, is still adhered to when the granulations require stimulation or repression.

Dr. W. Alexander,⁽¹⁴⁴⁾ who had considerable experience of varicose ulcers in the Liverpool Workhouse, considered chloral lotion most useful, as it both cleanses and heals. For superficial ulcers he used lötio boro - salicylica, for healthy sores chloride of zinc lotion, for inflamed or irritable ulcers lead and opium, carbolic, or Hutchinson's antiphlogistic lotion, consisting of acetate of lead, acetic acid and rectified spirits. Still he expressed

a preference for boric ointment, as a good routine remedy. Dr. Bond, Gloucester,⁽¹⁴⁵⁾ recommended Tereb- ine for indolent ulcers, as being cheaper than chloral lotion. Turpentine has also been tried. Guillemet⁽¹⁴⁶⁾ used bisulphide of carbon along with tincture of iodine.

Dr. Whitla⁽¹⁴⁷⁾ remarks that:— "Many therapeutists believe that hazeline exerts some specific action upon the coats of veins, and hence a lotion consisting of equal parts of hazeline and water is a favourite application to the so-called varicose ulcer."

Resorcin has been lauded by Frank⁽¹⁴⁸⁾ as "a potent agent in new epithelial formation," 10% in

(144)
Practitioner,
Vol. 19, p. 206.

(145)
Lancet,
16/9/76.

(146)
Practitioner,
1878, XX, p. 298.

(147)
Op. cit., p. 946

(148)
Clin. Journ.,
4/7/94.

plaster being applied as soon as healthy granulations appear; Stelwagon⁽¹⁴⁹⁾ endows resorcin with analgesic properties, and prescribes it as 8 to 12% ointment for painful ulcers, which he finds rapidly allays the pain.

In a paper headed "Varicose Ulcers Successfully Treated by a New and Painless Method", Dr. J. W. Summers⁽¹⁵⁰⁾ has praised the healing virtues of methyl violet, 2½ grs. to the oz. of distilled water. Doubtless this was "harmless or painless"; but as he also used bicarbonate of soda lotion before applying methyl violet, absorbent cotton and Martin's bandage after the dye was dry, and iodide of potash internally in doses of 10-15 grs. thrice daily, it is a little difficult to believe that the merit of the 6 weeks cures was entirely due to the aniline pigment.

Mercurial ointments, e.g. dilute nitrate, red or yellow oxide, white precipitate, etc., have been more or less displaced by unguents or oleates of zinc and lead, by ointments containing boric, carbolic, or salicylic acids, bismuth, etc. The methods of Prof. Unna⁽¹⁵¹⁾ of Hamburg, have been much quoted and adopted. He had the leg cleansed and shaved, painted it to the margin of the ulcer with a zinc paste, or glycerine

(149)
Practitioner,
1887, p. 144,
Vol. XXXVII.

(150)
N. Y. Med. Rec.,
24/11/94.

(151)
Ed. Med. J.,
Aug. 1885, and
Sept. 1895;
Clin. Journ.
4/7/94;
Rose & Carless
Man. of Surg.

jelly, which "sets" on cooling, and then applied a bandage, moistened in water, or soaked in the above preparation, which was changed once a week. The ulcer was dressed according to its condition, iodoform if torpid, nitrate of silver if exuberant. Bekare-

(152) witsch adopts a somewhat similar process, and

(153) Rosenthal also uses the zinc-gelatine bandage, which

is fenestrated to admit of a watch glass being put over the ulcer, which is dressed with some appropriate

ointment. The stiffened bandage is left on from 2 to 6 weeks. Hallum (154) got "excellent success" by

painting the ulcers with a preparation of white lead and linseed oil. Dr. Kerevski (155) employs an anti-

septic preparation of acetate of aluminium, and Dr.

Purdon (156) considered the combination of Friar's balsam

3i or 3ii, with zinc ointment 3i, as "nearly a specific for indolent ulcers." Dr. Sydney Gramshaw, (157) ack-

nowledging one failure, claims to cure ulcers in a month with hot water gruel for cleansing, and nitrate

of silver, 3i in flexile collodion 3iv, painted on the surface. He also uses an ointment of prepared chalk

and spermaceti. Rickett's (158) treated varicose ulcers

with hot water dressings and elevation of the limb.

For dry dressings numerous powders have been

(152)
Clin. Journ.,
7/10/94.

(153)
Practitioner,
1894,
Vol. LII, p. 290.

(154)
Ed. Med. J.,
March 1895.

(155)
Practitioner,
1894,
Vol. LII, p. 290.

(156)
Practitioner,
1893,
Vol. LII, p. 452.

(157)
N.Y. Med. Rec.,
27/8/92.

(158)
Virginia Med.
Monthly, 1885-
1886, p. 229.

employed, e.g. boric acid, iodoform, calamine, etc.

(159)
Borel-Laurez, of Neufchatel, is credited with one
of the many "new" methods. He covered the ulcer with
finely-powdered charcoal, and applied compress and
bandage, which were changed every second day. (160)
Vidal, of the St. Louis Hospital, is alleged to have obtained
"complete cicatrisation in the worst cases in 30 to
40 days," with subcarbonate of iron thickly sprinkled
on the ulcer, and a bread poultice over this. It was
repeated twice daily. (161)
Dr. C. P. Elwert claimed 34 favourable results in 46 cases of varicose and
other ulcers treated with a powder composed of iodo-
form, of sulphate of cinchonidia, and wood charcoal.
In certain cases he first poulticed with charcoal
and matricaria for some days, and then applied tinct-
ure of calendula and camphor water. As he used rest,
elevation of the limb and strapping, it is probable
that these methods were more potent than this farrago
of drugs.

Other writers have drawn attention to a number
of very dissimilar substances, one or other of which
each thinks has some special advantage for the heal-
ing of varicose ulcers, e.g. emplastrum miaculosum
(Dentler), benzoated zinc ointment, tanning with
babool bark (Roche), the hypochlorites - especially

(159)
Practitioner,
1881,
XXVI, p. 294.

(160)
Practitioner,
Vol. 28, p. 451.

(161)
N.Y. Med. Rec.,
31/10/91.

hypochlorite of lime (Panas), creoline (Colonna),
tartrate of iron, bitartrate of iron and potash
(Bourguignon), sulphate of copper (Blanc), salicylate
of bismuth (Desplats), papain, jequirity infusion,
ichthyol, dermatol, oleum rusci, and oil of cajuput.

III. The Etiology of Varix and Varicose

Ulcers of the Leg.

Etiology of Varix.

Considerable confusion has been introduced into the study of the origin of varix by writers having assigned as causes what are in reality only secondary factors. I refer to alleged agents such as constipation, undue length of limb, numerous kinds of occupation or trauma, and the like. Many a patient has had varix since childhood, when questioned as to its history he remembers some blow or strain he got when a boy (as in Case V.),⁽¹⁾ and persuades himself that this was the starting point. Or the patient may have paid little attention to the varix until it begins to give pain and trouble, then he is liable to attribute it to any illness or accident from which he may have recently suffered, or he is ready to accept some improbable cause suggested by a sympathetic friend. Too frequently the medical practitioner has received the patient's theory without due scrutiny, or the writer has been too prone to reproduce the traditional text-book etiology without cavil or consideration. Baron Dupuytren⁽²⁾ has remarked with dry humour that: —

(1)
V. p. 48.

(2)
On Lesions of
the Vascular
System,
p. 95.

"In investigating the causes to which varices have been ascribed, one cannot help being struck with the accuracy exhibited by authors in copying one another, from the time of Hippocrates downwards."

Besides the confusion arising from insufficiently distinguishing predisposing from exciting causes, or primary and secondary, there is the failure to differentiate between the causes of local and general varix, of varix originating in the deep veins and of that confined to the superficial system. There is also the fact that several causes acting in combination, gradually, repeatedly or continuously, and for a long time, may bring about a varix which would not have resulted from any one of these causes separately.

Most modern writers are agreed that:-

- I. The primary cause of varix of the leg is a disturbance of equilibrium in the relations existing between the internal pressure and the external resistance of the veins, the one being unduly increased, or the other diminished.
- II. The cause of this cause in a large number of cases is some individual idiosyncrasy, which is usually congenital and may sometimes be hereditary.
- III. The troublesome symptoms and sequelæ of varix date their origin from the time when the vein-valves become incompetent.

I. (1) The intravenous pressure may have a diminished vis a tergo owing to a weak heart, due to

senile debility or disease. (2) The intravenous pressure may have its vis a tergo augmented by any means which increases the rapidity of the circulation and leads to hyperaemia, dilatation and congestion of the capillaries, with temporary overloading of the veins. Such causes require to be long-continued and frequently repeated. (3) The intravenous backward pressure may be increased by some obstruction which encroaches on the lumen of the venous trunk or important branches. The impediment may be some form of external constriction, it may be the pressure of a tumour in the abdomen, pelvis or lower limb, or it may be a thrombus. (4) The external resistance of the vein wall may be lessened by want of muscular and fascial support, e.g. the saphenae as contrasted with the tibial venae comites; or there may be atrophy and absorption of surrounding structures, as in old age. The vessel walls may be initially lax and weak, or they may become softened by inflammation and disease.

II. The congenital abnormality may be by excess or by deficiency. (1) There may be over-development of the entire venous system, overgrowth of all the veins in a limb or only of the veins in a localised area. (2) There may be congenital cardiac weakness,

or defect from imperfect closure of foetal apertures and valves. (3) There may be an absence of one or more essential valves in important trunks like the long saphena and femoral; or the veins may be too thin from defective middle and outer coats, there being a lack of circular or longitudinal muscular and elastic fibres, or of white fibrous tissue; or, again, there may be a want of "tone" due to some nervous abnormality in the vaso-motor system.

Herèdity.

Hereditary influence has been frequently traced in all forms of circulatory disease, - cardiac, arterial, venous and capillary. The "hæmorrhagic diathesis" has a well known hereditary tendency, especially in males. Moles, mother's-marks, port-wine stains, naævus in all its forms - cutaneous, subcutaneous and mixed, scarlet or purple - are known to be frequently hereditary. The laity, and even a section of the medical profession, have gone further and asserted that maternal impressions influence the form and shape of these marks; in like manner, it is not at all rare to find examples of heredity in varix.

Mr. Breschet⁽³⁾ mentioned an instance of a father and several sons all suffering from varicocele. Mr. Pearce Gould⁽⁴⁾ states that sometimes every member of

(3)
Dunsmure's
Essay on Varix
p. 6.

(4)
Treves' Syst.
of Surgery,
p. 570 et seq.

a family is affected with varix for two or three generations. I have seen varix of the leg in a few members of a family for three generations, and once examined two brothers suffering from aortic aneurism. According to Mr. Bennett's⁽⁵⁾ tables a hereditary tendency was noted in 74 out of 259 males, and in 60 out of 315 females.

(5)
Varicose
Veins of the
Lower Extrem-
ities, p.4.

Vascular Affinities.

There is a continuous series of gradations from the capillary naevus to the stellate or crow's-feet-like injection of cutaneous venules, to phlebec-tasis and cavernous angioma. There are certain analogies or comparisons between naevus, cirroid aneurism, varix, aneurismal varix, varicose aneurism, and aneurism in some of its varieties. Mr. Duncan⁽⁶⁾ in discussing naevus has constructed an ingenious classification "in which the parallelism of the adult and infantile varieties is very manifest." Starting with the general term angioma, he shows that this may be purely arterial, as in aneurism by anastomosis, it may pass to the other extreme and be purely venous as in varix, or it may be intermediate in the capillary naevus, which he calls "a congenital clinical capillary metamorphosis." The erectile tumours may be non-congenital or congenital, and here comes in

(6)
Ed. Med. J.,
Nov. 1885, and
Feb. 1886.

his comparison. The non-congenital are erectile cavernous tumours, growths analagous to the cavernous tissue of the penis, and they may be simple, or capillary, arterial and venous telangiectases. The congenital erectile tumours may likewise be simple, arterial and venous telangiectases.

Developmental
Origin.

These affinities, the hereditary tendency, and the early appearance in infancy, childhood or adolescence, all contribute to support the view that Varix is frequently the result of a developmental error, which may take the form of a true overgrowth or of an undue thinness of the vein walls. It may be a constitutional diathesis, just as hæmophilia is, though on quite different principles. Hodgson⁽⁷⁾ long ago noted that varix sometimes arises from "preternatural weakness in the coats of veins which exists in various parts of the same person without any evident cause."

Von Lesser⁽⁸⁾ goes even further in asserting that varices originate as vascular growths, instead of being due to any hindrance to the return of venous blood.

He instances varix on the lips and in the mouth as examples for which no mechanical impediment can be claimed. But nævi are usually congenital, at least they appear within a fortnight after birth, and in many situations no obstruction to the circulation can be urged

(7)
Dis. of Art.
and Veins,
p. 537.

(8)
Virchow's
Archiv., Sept.,
1885; and
Ed. Med. J.,
Feb. 1886.

as a cause, e.g. naevus of the eyelids, nose, cheeks, lips, mouth, tongue, scalp, penis and vulva. Dr.

Ida Gridley⁽⁹⁾ has described a striking case of a woman with a congenital or inherent tendency to naevus and varix. At birth there was a "purple tumour" under the tongue. At 23 she had "a speck" on the left cheek, and varices about the vulva and anus. At 59 there was a varicose condition of the upper and under surfaces of the tongue, buccal mucosa and lower lip.

(9)
N.Y. Med. Rec.,
24/3/94.

Race.

Just as there are hereditary, congenital or developmental factors in the etiology of varix, so I believe there is a racial tendency. I am under the impression that civilised oriental nations, and also many savage races, are less subject to varix of the leg than the people of Europe. As man's erect attitude, and other causes acting through many thousands of years, have made him far more subject to varix than the lower animals are, so the civilisation, customs, clothing, habits and occupations of the Western hemisphere continuously acting through the countless generations tend to make Europeans more liable to varix of the leg than is the case with Orientals. We know that certain races, like the negro, are more free from hernia than the white man is. The Bengali is very subject to hernia and hydrocele, but he is not much troubled with varix of the leg.

Neither Orientals nor savages are accustomed to stand as much as Europeans do, they prefer to squat on their heels, sit or lie on the ground. A native shop-keeper in the **bazaar** serves his customers squatting amidst the goods in his stall, a native artificer does his work sitting, and a savage lolls about on the ground when not engaged in hunting or fighting. Even the mode of sitting differs, the European sits on a chair with his legs dependent, whereas the oriental tucks his feet under him, or stretches them out on the floor or couch.

The clothes of the oriental favour his immunity from varix. His legs are not encased in trousers or knickerbockers of European cut, nor has he need of stockings or garters. His legs are bare, or hidden under loose, flowing robes. The "dhoti" so commonly used is merely a sheet fixed round the waist, which hangs down over each thigh to the knee, and the free end is brought up between the thighs, along the perineum, and is tied over the sacrum. The foot-gear of the natives of India is also in his favour as regards varix. Many go barefooted, or wear the loose and shapeless country-shoe, with its curved turned-up toe and absence of heel. Again, if a hillman, he may wear "chaplis", which consist of leather soles and some

leather straps. The whole tendency is for him to give free play to the muscles of his feet, and even to use his toes for prehensile purposes. The European man or woman is only too often the slave of the bootmaker, who adapts the human foot to his idea of a boot. He cramps up the toes and crushes the feet in tight, sharp-pointed shoes or boots, and alters the natural line of gravity by fixing high heels somewhere about the instep. There is some constriction, too, at the top of the boot above the ankle, where the laces are tied. Now the blood passing up through the deep veins is dependent to some extent on muscular contraction. If the joints of the ankles and toes, if the muscles of the leg and foot are cramped or constricted by boots, laces, and garters, and if the occupation requires long standing, which entails venous congestion and a fixity of certain muscles, a state unfavourable to the return of venous blood, then much of the blood which should have passed through the deep veins has to find its way by superficial channels which are less well adapted to bear the strain. The constriction of the boot at the ankle is bad for another reason, because it is just about here that the deep and superficial veins communicate freely, and the veins of the foot unite to form the saphenæ.

Many a localised varix is due to valve failure or rupture, the result of some sudden or excessive muscular strain. Sustained and severe exertion is commoner amongst Europeans whose climate allows of it, whereas the enervating heat of India tends to make the native work more leisurely, less vigorously or forcefully, so that several coolies are required to do the work of one European labourer, and half a dozen servants are needed where one or two suffice in Europe.

In the introduction figures were given to illustrate the scarcity of operable varix in the Province of Lower Bengal. I shall now proceed to amplify these by other statistics. The Annual Report of the Sanitary Commissioner with the Government of India deals with the European and Native Army and the Jails in India. In 1895 and 1896 the average strength of British troops was 71,031 and 70,484, the average strength of the Native Army of India was 129,655 and 128,187, and the jail population was 106,337 and 110,090. The bulk of the prisoners are natives of India; but this total includes some Europeans, Eurasians, Chinamen, and other races, - so the jail statistics do not represent a purely native population, such as is the case with those of the

native army. During 1895, the total number of admissions for diseases of the veins was:-

	British Army.	Native Army.	Indian Jails.
	611	258	506
If we exclude piles, the figures for which } were	448	217	498
we get	163	41	8
Of these, varix	52	28	2
phlebitis & } periphlebitis,	46	9	4
varicocoele	34	1	1

The remainder were a few cases of venous obstruction, thrombosis, naevus, varicose aneurism and aneurismal varix.

There were 3 admissions for hæmophilia amongst British troops, none in the Native Army, and 1 amongst the convicts. Aneurisms, rupture and thrombosis of arteries amounted to 9 British, 7 Native Army and 3 in jail. If the single case of varicose aneurism and 2 cases of aneurismal varix be added to this list, the figures are, 12, 7, and 3 respectively.

	British Troops.	Native Troops	Jails.
Diseases of the Heart and pericardium.	528	81	153
Of these, Palpitation	336	22	20
Valvular Diseases	154	32	77
Peri- or Endocarditis	14	7	17

In 1896 the admissions for varix numbered 49 British, 32 native troops and 2 prisoners. The combined admissions for venous obstruction, thrombosis, phlebitis and phlegmasia dolens (sic) numbered 42 British, 6 native troops, and 9 prisoners. All the above figures for the British and Native Army apply solely to the admission of males, the figures for women and children being excluded. The statistics for jails include both sexes, but there are very few women and children in Indian jails.

From the foregoing statistics it is abundantly clear that though the numbers of the Native Army and Indian Jails far exceeded that of the British Army in India, yet the European admissions for varix, diseases of veins (except hæmorrhoids), of arteries and of the heart greatly exceeded those of the natives of India. These figures tend to confirm my impression that not only is varix both relatively and absolutely less

frequent amongst natives of India, but that they are also less subject to naevus, and to diseases of arteries requiring surgical interference. The next table applies to the "mofussil" civil hospitals and dispensaries of Lower Bengal, Madras and Bombay, excluding the population and the hospitals of the three presidency cities,- Calcutta, Madras and Bombay, for the years 1895 and 1897.

	Province of Lower Bengal.	Madras Presidency.	Bombay Presidency.
Population (exclusive of the three Presidency Cities)	70,665,427	36,166,070	26,694,594
Mofussil Medical Institutions 1895.	427.	486	306
1897.	477	466	312
Total Number of Patients treated 1895	2,479,779	3,839,354	2,382,069
1897.	2,834,112	4,092,551	1,742,804
Total number of operations 1895.	119,776	141,765	114,139
1897.	135,505	150,766	82,352
Operations for Varix, 1895.	1	1	0
1897.	1	8	2

There are a very few cases (Bombay 1 for 1897, Madras 4 for 1897) in the returns shown under the

heading "Injection of other Fluid than blood into a Vein." These I have not included under "Operations for Varix", because the significance of the terminology is so vague. For what was the fluid injected? Was it as a coagulant injected into a varicose aneurism? Or for varix? Or was it some intra-venous injection of saline solution, etc., for cholera, hæmorrhage, etc.? The marked decrease in patients and operations during 1897 throughout the Bombay Presidency was probably owing to plague and plague scares.

I find much the same absence of operations for varix of the leg in the medical reports and returns for Assam, Burmah, the Central Provinces, and the North-West Provinces and Oudh. During 1896 and 1897 there was only one operation for varix in Assam, which had a population of 5,476,833, and 101 medical institutions treating 568,696 and 609,490 patients, on whom 13,070 and 13,335 operations were performed. In Burmah there were no operations for varix in 1895 or 1896, and only one in 1897 if three cases of "injection of fluid other than blood" are excluded. In the Central Provinces only one operation for varix was performed during the two years 1895 and 1896, though it has a population of 12,944,805. The medical institutions numbered 117 and 95, treating 1,261,590 and

1,374,129 patients, with 31,416 and 23,294 operations. In the North-West Provinces and Oudh there were only 4 operations for varix in 1895, and 3 in 1897, if we exclude two cases of "injection of fluid other than blood." The population was 46,905,085 and in 1897 there were 355 medical institutions treating 3,692,416 patients, with 168,538 operations. The Punjab forms the only exception I have come across to this striking scarcity, or almost entire absence of operations for varix. It contains a population of 20,860,913, in 1895 and 1896 its medical institutions numbered 257 and 267. In the former year the patients numbered 3,260,617 and 234,749 operations were performed. In 1895 there were 23 operations for varix, - 16 ligature of veins, 1 division, 4 excision, and 2 injection of Tr.Ferri. In 1896 there were 15 operations for varix, not including 1 for "excision of a thrombosed vein." In 1897 there were 10 operations for varix, excluding 2 for "injection of other fluid than blood into a vein." The reason that from 10 to 23 operations for varix appear in the Punjab returns is, I suspect, due to the fact that so many Europeans and Eurasians are treated in the hospitals and dispensaries at Simla, Lahore, Peshawar, Rawal Pindi, etc. This conclusion is supported by the returns for the

hospitals and dispensaries of Calcutta, Madras and Bombay. Europeans congregate in these cities which contain medical institutions exclusively for them, at which more operations for varix are done in one year than are performed during several throughout the presidencies or province of which these cities are the centres.

Sex.

Does sex influence the incidence of varix of the legs? The relative frequency of varix is a moot point. Walsham⁽¹⁰⁾ and Pearce Gould⁽¹¹⁾ maintain that it is commoner in men. On the other hand, Billroth, Bennett, and the Text-book of Surgery by American Authors state that varix is more frequent in women. In Bennett's tables⁽¹²⁾ the females exceed the males by 21.62 per cent. All writers are agreed, however, that the liability of women is largely due to pregnancy. There can be no doubt that repeated pregnancies play a most important rôle as an exciting or determining cause, whatever may be the predisposing or originating cause. Bennett's tables comprise 315 females and 259 males. Those affected with varix in both legs numbered 163 females and 92 males. That the excess of females was connected with some such factor as uterine enlargement and pressure, which tends to affect both legs equally, is rendered still more probable by the fact that only 20 females had varix of both limbs

(10)
Surgery, p. 327.

(11)
Heath's Dict.
of Pract. Surg.
&
Treves' Syst.
of Surgery.

(12)
Op. cit., p. 4.

before the age of 25, none after 40, and 119 between 25 and 40, i.e. an enormous increase during the child-bearing period, at which repeated pregnancies make a permanent effect on the veins of the lower extremities. Another fact pointing to the same conclusion is that the number of men (93) and women (91) with varix of the left leg only was practically equal, whereas in the case of the right leg only there were 74 men to 61 women. Amongst "apparent causes, acting singly or in combination" Mr. Bennett gives pregnancy as the cause in 152, and constipation in 122 women. Pregnancy, he says, "acting either alone, or as often happens, in combination with constipation, accounting almost entirely for the large excess of cases of general varicosity seen in females." He means general varicosity of the lower extremities. There may be various explanations for the conflicting evidence concerning the relative frequency of varix in the sexes. One may be that the practice of a good many surgeons, especially hospital surgeons, lies more amongst men. Varix interferes with the occupation of the bread-winner, therefore he is more likely to seek relief in operation. A woman is more readily content with the palliative measures of the general practitioner, often because they suffice for

her needs, and even if they do not she prefers some degree of inconvenience to an operation and stay in hospital, involving separation from home and family. In the East, owing to custom and caste, one treats a score of men to one woman, and operations must be 50 times more frequent on males. My own impression is that general varix of both limbs is more frequently met with in women, who also suffer more inconvenience in early varix and seek medical relief in greater numbers than do men at a corresponding stage. Whereas local varix and varix of one limb is as common, or even commoner amongst men, who more quickly arrive at the stage of the complications which follow on venous valvular incompetence, owing to their habits and occupations. These sequelæ are more serious, and they interfere with work and active exercise, consequently more men than women submit to operation. Mr. Walsham believes that varix is commoner in men because they are "more exposed to the exciting causes." It is true they are more liable to traumatism, and the nature of their occupations may prove more conducive. But we must not forget that varix is no respecter of persons, it occurs in the weak as in the strong, in the puny as in the well-developed, at all

ages, and amongst those with sedentary occupations as well as amongst the strenuous and active. This fact argues in favour of the inherent developmental factor. Mr. Pearce Gould⁽¹³⁾ explains that though varix is commoner in men, yet women apply more frequently for relief, - "owing to the frequency with which pregnancy increases the fullness of, and the pain in, the veins." There is no doubt that pregnancy accentuates the trouble of varix, and women seem to suffer more than men do. Pregnant women are very apt to suffer from swelling and oedema of the feet and legs, and also from pain in the veins owing to the increased pressure. The gravid uterus, gradually enlarging, causes nausea, vomiting and indigestion, it conduces to constipation, and it renders the bladder irritable. If the altered intra-abdominal pressure can so profoundly affect the system, likewise it can cause obstructive pressure on the iliac veins and finally on the inferior vena cava. It may be argued, however, that varix tends to disappear after parturition. This is true of the first pregnancy, and if due care be exercised after childbirth. But it is the repetition of the pregnancies and deliveries, the neglect of the legs in the intervals, which do the mischief.

(13)
loc. et op. cit.

There are several other minor factors favouring varix in woman. Ovarian and uterine tumours act

similarly to pregnancy as regards varix. Menstrual irregularities may conduce to trouble in varices, or they may be an exciting factor. Bennett has pointed out that the spontaneous œdema of early varix occurs almost entirely in women, and begins frequently between puberty and twenty years of age, the period of catamenial irregularities. "Women who suffer from varicose œdema at this early period almost always suffer from varicose complications during child-bearing, a useful clinical fact." (14)

(14)
Clin. Journ.,
19/1/98.

Age.

The age at which varix begins is often obscured by the patient failing to distinguish between the actual date of commencement, or the time when he first noticed it, and the period when he was at first seriously inconvenienced by phlebitis, œdema, eczema, ulcer, etc., i.e. many years after the varix has been in existence.

It is not improbable that age may exert an indirect influence, I mean that more persons of a certain period of life may suffer owing to this or that cause coming into operation. For instance, amongst those who are born with a predisposition to varix, some will develop it in childhood, because in them the tendency is most marked and is readily brought out by the incessant activity displayed at this period. But in a

much larger number the inherent abnormality of the venous system will lie dormant until adolescence is passing into early manhood, and will declare itself between 17 and 25 or 30, when the bodily mechanism is attaining its full powers and is being most subjected to strain. Between 30 and 40 cases with a possible congenital predisposition become scarce, and the other class of cases increases in numbers, - those in which augmented venous pressure or diminished venous resistance has been provoked by occupation, habits, disease, constitutional states, and injuries. Where there is no developmental tendency, varix may not arise till 40 or 50, or even later in life. Here the veins may suffer loss of support from atrophy of surrounding tissues and structures, owing to natural involution and decay. Moreover, with the advance of age, the palpable effects of the summation of stimuli become more apparent, - the long-continued application of many slight secondary causes begins to bear fruit. In the course of growing older the individual is rendered more liable to phlebitis or thrombosis from gout, cardiac disease, fevers, tumours and other influences conducive to weakened circulation, venous obstruction, and varix.

Syme⁽¹⁵⁾ thought "that varix seldom appears in the limbs before maturity;" in the Text-book of Surgery by American Authors it is said that the "tendency increases as age advances;" Rose and Carless⁽¹⁶⁾ make the same statement with the restriction "till the middle period of life is reached." Dunsmure⁽¹⁷⁾ maintains that:-"In children all the veins are thicker than in old people, which is exactly the reverse with the arteries." Mr. Pearce Gould⁽¹⁸⁾ believes that varix is rare in children, and is most often developed between puberty and full manhood; elsewhere⁽¹⁹⁾ he has observed that varix usually appears between 20 and 35, and at an earlier age in hereditary cases. In Mr. Bennett's tables varix was first noticed in 94 males and 85 females before the age of 25, in 84 males and 139 females between 25 and 40: whereas after the latter age its apparent commencement was much less frequent, only 36 males and 14 females being mentioned, in all of whom the disease was confined to a single leg.

(15)
Princ. of Surg
p.120.

(16)
Manual of
Surgery,
p.297.

(17)
Essay on Varix,
p.7.

(18)
Treves' Syst.
of Surgery.

(19)
Heath's Dict.
of Pract. Surg.

One or Both
Legs.

Whether one or both legs be affected, or which of them, is immaterial as a causal factor per se. But the presence of double varix may be of interest as confirmatory evidence of the prevalence of congen-

ital and hereditary cases, or in showing the etiologic-
al importance of pregnancy, pelvic and abdominal tu-
mours, or other causes affecting both limbs equally.

Right or
Left Leg.

It is frequently stated that varix is commoner
in the left leg, and consequently it has been assumed
that this must be due to constipation, to pressure-
obstruction of the loaded sigmoid flexure. (20)
Mr. Spence has shown the fallacy of this hypothesis. "The truth
is, that the disease is almost as common on the right
side, and the cæcum if distended would press upon
the right iliac veins just as much." Farther, there
is no proof that constipation does more than re-
veal the existence, or accentuate the presence of
varix of the leg, and there is no evidence that constip-
ation ever causes it, whatever influence it may exert
on hæmorrhoids. Mr. Bennett's tables show:-
Males, 92 both legs, 93 left, 74 right; females, 163
both legs, 91 left, 61 right.

(20)
Lectures on
Surgery,
p.263.

Stature and
extra length
of crus.

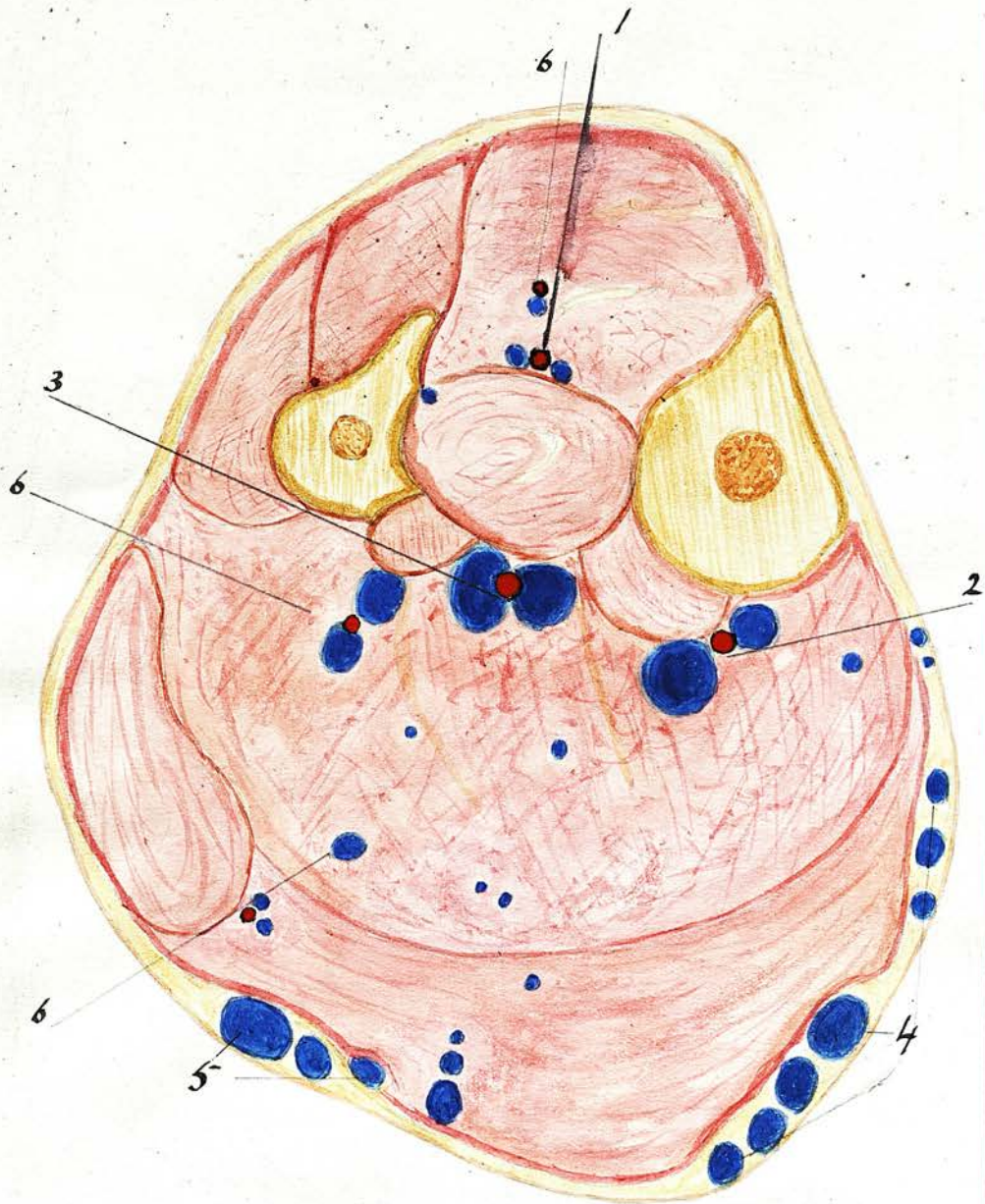
Tall stature and disproportionate length of the
lower limbs, especially if long below the knee, may be
set aside as stock phrases in the older text-books.
Such a cause may have helped "to favour stagnation of
the blood;" but so does the general direction of the
veins in any person, be he long or short, as the blood

has to make its way upwards against the action of gravity. When once the valves of the long saphena have become useless, then the column of blood in a long limb will be longer than in a short limb, and should produce a proportionately greater adverse effect; but this is a very different thing from assigning height as a cause. It would be necessary to prove that tall people are more subject to varix than short ones.

Superficial
&
Deep Varices.

It may be taken for granted that varix is commoner in the lower limb than in any other situation, commoner than hæmorrhoids or varicocele, which rank next in frequency. There is good reason for this, considering that the veins in the lower extremity are the longest in the body, that their contained blood is at a mechanical disadvantage in having to find its way upwards from the foot to the heart, that the legs are in such constant use and have to bear the weight of the body, and because of many sources of obstruction, pressure, and even constriction. It may also be accepted that the leg is more liable to varix than the thigh, and that the long saphena is earlier and more often affected than the short saphena. But there is no such agreement on the question of whether the superficial, the deep, or both systems of veins are

most frequently rendered varicose. Those writers who say the subcutaneous veins are most liable to varix have as arguments, (1) the great length of the saphenæ, (2) their want of muscular and fascial support, (3) the additional strain on the superficial veins, (a) either when too much blood is driven into them from the deep veins during sudden, severe or sustained exertion, (b) or when the deep veins cannot convey their usual amount owing to the absence of muscular contraction involved by long-standing or inaction. Others urge that the deep veins are always first affected, and that superficial varices are merely the outward manifestation of the internal disease, which becomes apparent when valvular incompetence is complete in the deep veins. Some of those who hold to the congenital origin of varices consider that both sets of veins are equally affected, because the overgrowth or the weakness is general in the veins. While the fact that varix may be extremely localised, perhaps a single cyst-like dilatation about some important valve, or a solitary varicose branch while the main trunk and its other tributaries are unaffected, points to another origin, to some undue strain or trauma. Indeed, there is frequently



Transverse Section through Middle of Leg: Arteries + Veins injected.

- 1 Anterior Tibial Vessels
- 2 Posterior Tibial Vessels
- 3 Peroneal Vessels

- 4 Internal Saphena & branches
- 5 External Saphena & branches
- 6 Intra-muscular Vessels

ROUGH DIAGRAM OF SECTION IN PROF. CHIENE'S MUSEUM.

a clear history of some definite injury.

Through the kindness of Professor Chiene, I have had the opportunity of examining a most interesting specimen of injected varices in a section through the middle of the leg. Two things strike one on looking at this preparation, viz. (a) the unequal distribution of the varicose disease, for all the vessels on the front of the leg appear quite normal, (b) whereas both deep and superficial veins behind the plane of the interosseous membrane are markedly affected.

The accompanying rough diagram gives some idea of the condition. There are no superficial veins injected on the anterior and external aspects of the leg. All the enlarged subcutaneous veins are on the internal and posterior sides of the leg, in the neighbourhood of the two saphenæ. There are some nine sections of the dilated internal saphena and its tortuous tributaries, and some two or three sections of the external saphena group, one of which is very large. Between the two sets of vessels, but apparently more closely related to the external saphena and within the substance of the middle part of the gastrocnemius, are three or four more veins

superposed on one another, of which one or two are varicose.. Turning to the deep veins we find extremely few vessels injected in the anterior segment of the leg. The anterior tibial and its venae comites are normal, and just in front of them is a small muscular branch with its accompanying vein in the tibialis anticus. Between the tibialis posticus and the fibula a small vein is injected, and a small artery appears between the fibula and the peroneus brevis. But behind the deep flexors and the bones of the leg the main veins are enormously dilated and the intramuscular branches are numerous and conspicuous. The posterior tibial and peroneal arteries both appear larger than the anterior tibial. The venae comites of the posterior tibial are huge and seem to encroach on the flexor longus digitorum, and there are three veins internal and close to the inner vena comes. The inner of the peroneal venae comites is as large as either of the posterior tibial, and the other is still larger. This outer vena comes seems to encroach on the flexor longus hallucis, and to displace the peroneal artery away from the fibula in a backward and inward direction. Much in the same line as the tibial and peroneal vessels, but external to the latter and just behind the fibula,

is a muscular branch of no great size which is accompanied and embraced by very large venæ comites.

Throughout the substance of the soleus and gastrocnemius there are about a dozen more injected veins, few of which are varicose.

Mr. Harold Stiles has shown me a series of sections of the thigh and leg, illustrating deep-seated varix of the limb. By hardening the tissues in formalin he was able to make most conspicuous the varicose inter- and intra-muscular veins.

But superficial varix frequently occurs without any symptom of deep varix during life, and without any post-mortem appearances of disease or dilatation in the deep veins. Dr. A. W. Hughes⁽²¹⁾ has recorded the results of dissections of well-marked varices in four bodies. In none of them were the deep veins affected, and in all the long saphena was varicose, as well as that part of the short saphena beneath the deep fascia in the popliteal space.

Besides these four Dr. Hughes mentioned a fifth case in which he found pronounced varix of the popliteal vein, "while the rest of the deep veins were normal."

Verneuil,⁽²²⁾ as the result of his experience and of the dissections he made, came to a diametrically opposite conclusion some 45 years ago. In^a paper read

(21)
B. M. J.,
16/7/87.

(22)
Lancet,
3/11/55.

before the Paris Academy of Medicine he asserted that subcutaneous varix is a secondary condition, that the primary lesion is always in the deep veins, and that the muscular veins of the calf are most often at fault. He laid great stress on a venous plexus between the two layers of muscles of the calf, as specially liable to varix. Mr. Callender drew attention to the intra-muscular veins, and showed that the six chief veins passing from the soleus to the posterior tibial and peroneal vessels had a united diameter of not less than an inch. Wherever superficial varices occur, corresponding deep varices will be found, M. Verneuil declared; but the converse does not hold, because inter- and intra-muscular varices exist when the superficial veins may be quite normal, though the latter will probably suffer sooner or later. "The deep veins are first affected with valvular insufficiency and dilatation, and these two lesions then spread to the super-aponeurotic branches of the second and third order." M. Verneuil's conclusions were regarded as "a new discovery", and were said to explain the etiology and symptoms, and the mechanism of relapses. At any rate, his communication helped to discourage operative interference, and to confirm the policy of laissez-faire which had been in vogue for the previous half century.

The opinions of other writers are almost as divergent as those of M. Verneuil and Dr. Hughes.

Billroth⁽²³⁾ taught that "most commonly the larger veins of the subcutaneous tissue are implicated;" but he noted that sometimes the deep veins are chiefly affected, or that both deep and superficial are involv-

ed. He also drew attention to the occurrence of a varicose condition in the smallest veins of the cutis, which caused the skin to appear bright blue and rough.

Mr. Duncan⁽²⁴⁾ considered deep-seated varicosity as rare, and Mr. Spence⁽²⁵⁾ that the deep-seated veins are less liable to varix. The internal saphena is the most often varicose according to the Text-book of Surgery by American Authors⁽²⁶⁾, but "occasionally deep veins are primarily affected." Dunsmure⁽²⁷⁾

said the same about the saphena and other superficial veins, but noted that the femoral vein had been found varicose. Mr. Pearce Gould⁽²⁸⁾ thinks that varix is "chiefly observed as a disease of the superficial veins, but it affects very often intermuscular and intramuscular veins as well; but the main deep veins of the limbs, with the exception of the posterior tibial veins, are generally free." Mr. Keetly⁽²⁹⁾ believes that "the deep veins are nearly as often affected as

(23)
Gen. Surg. Path.
& Therap.,
p. 524; and
Lectures on
ditto,
Vol. II, p. 315.

(24)
B. M. J.,
9/7/81.

(25)
Op. cit., Vol I,
p. 263.

(26)
Vol. I, p. 218.

(27)
Op. cit., p. 11.

(28)
Treves' Syst.
of Surgery,
Vol. I, pp. 570
to 577.

(29)
Index of Surg.
p. 436.

the superficial," and Mr. Walsham⁽³⁰⁾ that "the deep veins are generally involved." Mr. Bowlby⁽³¹⁾ appears to contradict himself, because in one place (page 215) he says:- "The superficial veins are more often diseased than the deep ones, for they are not supported by the muscles." A couple of pages further on (p.217) this is negatived by:- "It is commonly supposed that, in the lower extremity, it is the superficial veins alone that become dilated; but this is not the case, for, in almost all patients in whom the superficial veins are varicose, the deeper ones are similarly affected."

From a consideration of these various statements it would appear that varix may be primarily superficial or originally deep, and that it may extend from the latter to the former, also that deep varix may be local or general just as is the case with the superficial variety. But, in the face of so much conflicting testimony, it is evident that more extensive observations are wanted, such as can be obtained only by accurate collective investigation in the anatomical and pathological departments of large medical schools. Special and methodical scrutiny of the veins in the extremities is required, because routine examination of the veins is very rarely carried out in the post-

(30)
Surgery,
Its Theory &
Practice.

(31)
Surg. Path. &
Morbid Anat.,
Chap. XXVIII.

mortem room, and even in the dissecting-room and manuals the attention of students is far more particularly directed to the arteries and nerves, owing to the variety, irregularity, and lesser importance of the veins, and since they are rarely injected like the arteries.

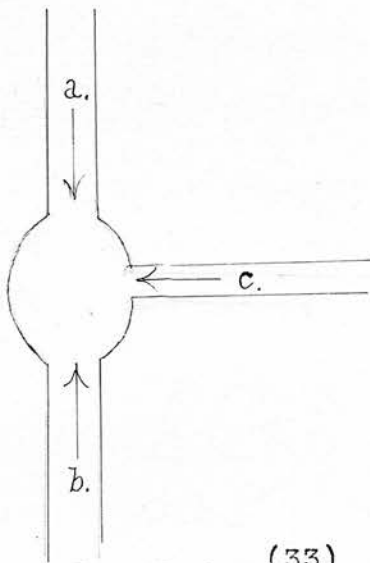
Anatomical,
physiological
& pathologic-
al causes.

There are several anatomical, physiological and pathological factors that influence the etiology of varix, or have been supposed to do so. The lack of support afforded to the superficial veins by the subcutaneous areolar tissue; the great length of the veins in the lower limbs, with the long columns of blood which their valves have to support; the diminished force of the circulation at the extremities, more marked when the heart is feeble; the liability of the main venous trunks to muscular compression, resulting in blood being driven from the deep into the superficial veins during severe exertion; these, and many other points, have all been insisted on. Pressure is supposed to be greatest behind a valve, at the point of entrance of a branch vein, or where a vein perforates fascia, which is supposed to explain the tendency for varix to develop at the junction of deep and superficial veins, or the frequency of its occurrence where veins dip through fascia or enter muscles in constant use. Hence the liability of the long saphena at the cribiform fascia, and of the short saphena under the popliteal fascia.

In Mr. Treves' "Surgical Applied Anatomy" (32)

(32)
p. 454.

there is a good diagram illustrating the statement that "varix appears to commence most often at points where deep veins join superficial."



- a. "Weight of superincumbent column of blood.
- b. "Resistance offered by the next valve below the point of entry of the deep vein.
- c. "The force with which the blood is driven by the contracting muscles out of the deep vein into the superficial trunk, acting at an angle to both the lines of force."

Dr. Hughes (33) considers that the long saphena

(33)
B. M. J.,
16/7/87.

is more liable to varix than the short saphena, because it "lies between skin and bone, in a great part of its course, being thus unsupported by muscles!" Whereas "the contraction of the muscles of the calf compresses it (short saphena) against the skin, which is rendered tense by the thickening of the limb caused by contraction of the muscles; but that part of the short saphena which lies in the popliteal space does tend to become dilated, as it is not supported by the contracting muscles."

Collections of hard fat in obese persons, femoral hernia, a badly-applied truss, lymphangiectasis

in the groin from filariasis, large masses of indurated femoral and inguinal lymphatic glands, or cicatricial contraction after suppurating buboes and sinuses, may occasionally lead to obstructive pressure about the saphenous opening through tension of the falciform process of the fascia lata, and thus interfere with the junction of the long saphena and femoral veins.

Likewise pregnancy, uterine and ovarian tumours, ascites, malignant disease of the rectum and other pelvic viscera may tend to exert pressure on the iliac vessels. It is clearly recognised that any and every form of obstructive pressure does not produce varices. Suddenly-developed pressure, such as that caused by thrombus in the external iliac or femoral vein, will primarily result in œdema, whatever the ultimate effect may prove. Von Lesser⁽³⁴⁾ proved by experiment that artificial thrombosis in a main vein of a dog, produced by injecting gypsum into a venous trunk, did not cause varicosity. The effect was "transitory. congestion, œdema, and simple dilatation of collateral cutaneous veins." Billroth⁽³⁵⁾ notes that sudden venous obstruction causes œdema, just like ligature of, or thrombus in, a vein. He says the pressure must be gradual, with a coincident tendency to dilatation of the vessels. Dr. Duncan⁽³⁶⁾ also lays consid-

(34)
Ed. Med. J.,
Feb. 1886, p. 795

(35)
Op. cit., p. 525

(36)
Ed. Med. J.,
Feb. 1886.

erable stress on this, and he points out that the "obstruction is most injurious which impedes without entirely arresting the flow." He shows it is "essential that pressure, obstructive or other, must continue to act, notwithstanding the enlargement of the veins."

Phlebitis is a frequent accompaniment of varix. It may help to produce varix, or to aggravate its effects. It may act in several ways;- by producing thrombosis, by causing adhesions of the valve-cusps to the vessel wall - thus rendering the valve useless, or by causing unequal thinning and thickening of the vein walls at different points. Another pathological point of some importance is that the intact and healthy endothelium of a vein keeps the contained blood fluid; but solution of continuity in the endothelium, as must frequently occur in the pouchings and cyst-like dilatations in varix, may result in the formation of small coagula. Indeed, Mr. Bennett,⁽³⁷⁾ in referring to the liability of middle-aged subjects of varix to suffer from cramp in the legs, has hazarded the conjecture that:- "Cramps are due to the repeated occurrence of small thrombi in the intra-muscular veins. "

Hyperaemia and congestion, to the extent of embarrassing the return circulation, may result from inflammation, injury or disease of the leg, from ex-

(37)
Clin. Journ.,
19/1/98.

tremes of heat and cold, from monotonous exercise or many occupations.

Traumatism.

In 60 cases of varix of the upper limbs Mr. Bennett⁽³⁸⁾ found 26 followed on injury. The most obvious form of traumatism to cause varix is that of deformity in a badly-united fracture, with excessive callus-formation, the result being that obstructive pressure is brought to bear continuously on important veins, e.g. Case VIII. The starting point of varix is frequently attributed to some sudden severe strain or injury, causing abnormal distension of some vein or rupture of its valves. Thus it comes that heavy-weight-lifting, putting the shot, throwing the hammer, tossing the caber, accidental wrenches or strains at football, cricket, rowing, lawn-tennis, rackets, even golf and cycling, have been blamed for varix as well as for hernia. It is considered that sudden and excessive pressure can overcome the resistance of the valves and walls of the veins, which become affected by repetitions of the abnormal strain. In discussing the causes of varix, Mr. Hodgson⁽³⁹⁾ first mentions that "sometimes valves are ruptured by muscular exertion or external violence, in which case the pressure of the column of blood is the first cause

(38)
Lancet,
5/5/94.

(39)
Dis. of Art.
and Veins,
p. 537.

of dilatation." Even where trauma seems clearly the exciting cause, it often happens that it is impossible to exclude the existence of a predisposition to varix which may be a far more potent causal factor than any violence. By many it is doubted whether trauma is an adequate cause in the absence of a congenital tendency. Mr. Treves⁽⁴⁰⁾ has reported a case that seems a good example of traumatic origin. When 7 years old a boy was kicked in the lower part of the abdomen by a horse. Some months later varices appeared in the left leg, and gradually extended until, at the age of 17, the whole of the long saphena was varicose and terminated in a huge mass at the saphenous opening. The left superficial epigastric and circumflex veins were also varicose, and Fennick's vein from the groin to the axilla was enlarged. Cause and effect seemed clear enough, still one cannot help suspecting a congenital predisposition, partly because the varix developed so early in life, and partly because he had a double varicocele as well. Dr. Ellis⁽⁴¹⁾ has recorded a case of varicose abdominal veins in a lad of 16, grave symptoms supervened immediately after exposure to the supposed cause, and varix was apparent in 10 weeks' time. In this instance there was probably sudden obstruction of the lowest part of the

(40)
B. M. J.,
8/10/81.

(41)
N. Y. Med. Rec.,
23/1/92.

inferior vena cava. I operated on a curious case of lumbar varix⁽⁴²⁾ in a French mechanic 29 years of age. There was a varicose mass within the aponeurosis of the latissimus dorsi, there was no varix elsewhere, and the only probable cause that could be elicited was strain from using a heavy hammer.

(42)

Ind. Med. Gaz.,
Oct., 1898.

It is possible that certain occupations may act as exciting causes of varix, owing to the sudden and violent strains which those who follow them may be subjected to. Amongst cavalry soldiers I have noticed varix in the popliteal space, and on the inner side of the leg or thigh just above or below the knee. It seems to me that the powerful grip of the adductors, often called suddenly and violently into action on horseback, may tend to produce varix just below or behind the seat of abnormal pressure. Seamen, I believe, are also prone to this affection, and to an exaggerated degree. Although the sailor is not a great walker, yet he has often to stand for long periods of watching or steering. But of greater moment is the fact that he is subject to sudden strains and severe exertion of the muscles of the thigh and calf, which must cause great variations in blood pressure. He has to climb rigging and spars, to which he must cling with his legs while his hands are engaged with

ropes and sails. Life on board ship tends to constipation, and the pressure of a loaded colon will make an impression after the standing and strains have started the varicosity. A sailor with varix is not unlikely to suffer from ulcers. Mariners are liable to injuries of the legs in rough weather, from knocking against cargo, beams, hatches, steps, etc.

Gravity.

The force of gravity has been very generally cited as a stock cause of great importance in the etiology of varix, and in consequence persons who develop varix, and follow occupations which involve habitual standing, are supposed to be the victims of their calling. It is not improbable that an undue significance has been accorded to gravity and the erect posture as the causal agent in healthy people, though undoubtedly it may prove a potent factor in aggravating the symptoms once the complaint has developed, or may even cause varix in persons with congenitally weak and lax venous systems. It is true that the arterial stream in the lower limbs flows down-hill, while the venous current has to ascend against the force of gravity; but the effect of this is largely annulled when the valves are intact, and the strength of the vessel walls, as well as the

contraction of muscles, help to compensate for the mechanical disadvantage of the veins. The existence of numerous collateral channels, the pliancy and slight physiological resistance of veins, are also in their favour to relieve the effects of obstruction and gravity. If gravity was all-powerful, the stress of varix and ulcers would tend to be most severe at the periphery, on the feet in place of higher up. But given some predisposing cause, congenital or acquired, or once the valves are inefficient, then it is obvious how liable to suffer must be those who stand all day behind counters in shops, policemen, laundresses, engine-drivers and stokers, omnibus and tram-car conductors. As regards the latter there is the additional factor of long-continued vibratory motion, to which Dupuytren⁽⁴³⁾ drew particular attention.

(43)
On Lesions
of the
Vascular Syst.

Etiology of Varicose Ulcers.

Varix indirectly originates or perpetuates varicose ulcers. A vicious circle is set up. The return flow of blood is impeded in the area drained by the varices; first intermittent, later chronic congestion, swelling, oedema occur from exudation of

serum, and the tissues of the limb become water-logged; the haemacytes transude, pigment is deposited, lymph spaces and capillary channels get blocked. The ulcer may now arise in many ways. The sodden cuticle is readily abraded or scratched, there is no tendency to repair, rather to the formation and extension of a sore. There is impaired vitality (a) from diminished supply of pure arterial blood with consequent lowering of the temperature at the periphery, (b) from the stagnation of venous blood; (c) and from the accumulation of serum, carbonic acid, and other effete products.

Both varices and varicose patches are prone to inflammatory attacks. This inflammation takes the form of phlebitis in the former case, and of eczema going on to ulcer in the latter, or of chronic induration also associated with ulceration. An inflamed superficial varicose dilatation may become adherent to the skin, thinning of both structures may result, ending in rupture and hæmorrhage, with the formation of an ulcer. This happens but rarely. Occasionally an abscess may form round a thickened or inflamed vein, in which case a chronic ulcer is likely to follow. Scorbutic extravasations in a varicose limb may also be associated with ulcer-formation. If the cutaneous

capillaries or venules are varicose, rupture and ecchymosis may readily occur, and be succeeded by a superficial ulcer, which will tend to deepen and spread.

It has been pointed out that venous engorgement of the skin or limb tends to perpetuate the ulcer; but there is another factor of great importance. Varicose ulcers usually occur in the lower third of the leg, to the inner or outer side, according as which of the saphenæ is affected. This is just the situation most favourable for the lodgment of dust and micro-organisms. These microbes tend to irritate an eczema, and in the devitalised tissues of the varicose ulcer they find an excellent soil for their pabulum and propogation.

Mr. Hilton's⁽⁴⁴⁾ explanation for the favourite site of varicose ulcers seems clear and sufficient.

"The superficial and deep veins of the leg freely communicate with each other in the neighbourhood of the ankle-joint. The first two inches above that point is the spot where the greatest stress is laid upon the superficial veins; below that point they freely communicate, and if the blood cannot return by the superficial veins, it can do so by the deep

(44)
On Rest &
Pain,
p.194.

veins, or vice versa. But when you reach the point where that brown patch so often occurs in old persons, above the inner malleolus, the anastomoses are less free, and this appears to me to be the reason why ulcers from varicose veins occur so frequently about that neighbourhood."

Though he acknowledged varicose ulcers to be ultimately the result of varices, yet M. Quénu⁽⁴⁵⁾ was of opinion that there was some further determining cause, and this he believed to be "a neuritis of the cutaneous filaments." But few will agree with him in regarding a varicose ulcer from the same tropho-neurotic standpoint as a perforating ulcer of the foot, nor will they grant that the neuritis is primary or corresponds to the course of the larger diseased veins. It would serve no good object to discuss Mr. Gay's⁽⁴⁶⁾ denial of the existence of varicose ulcers; his curious classification of idiopathic, venous and arterial ulcers; his quaint theory of hypovenosity and hypervenosity; and his numerous changes of opinion, which give his views rather an inconsistent and kaleidoscopic character.

(45)
Practitioner,
Vol. XXX, p. 144

(46)
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11/1/68,
4/11/68,
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31/7/69,
4/11/71,
29/6/78,
also
Lettsomian
Lectures for
1867.

In compliance with regulation XVII of the Regulations for Graduation in Medicine & Surgery, applicable to all who commenced their Medical studies before 1st October 1892, I certify that this thesis on Varix has been composed entirely by me, that it contains the results of original observations, as well as a digest & critical exposition of the opinions & researches of others, accompanied by precise references to the authorities quoted. D. M. Moir.

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